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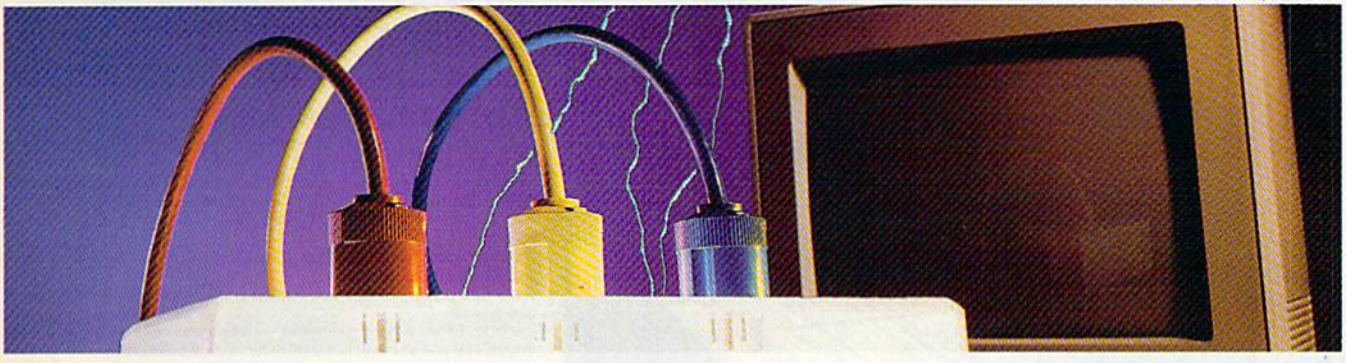

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EDITOR'S notes

In case you haven't heard, Commodore reported a $6.5 million loss for the quarter ending September 30, 1989. At this writing, we're waiting for word on the following quarter (translation: Commodore's Christmas). Commodore won't release its bottom-line number until after you read this, so we'll follow up in one of our next couple of issues.

Commodore blamed its poor third-quarter performance on slumping 64 sales and added that Amiga and PC-compatibles sales were up compared with last year's third-quarter sales.

Despite the bad quarter, Commodore appeared to be in general good health. We'll soon see how the all-important fourth-quarter results affect the company's vitality.

We've heard through the grapevine that the rumored 64 upgrade machine—dubbed the 64GS by yours truly in the September 1989 "Editor's Notes" and the Commodore 65 in other quarters—will not be delivered. Too bad. It sounded like an interesting machine with some potential.

****

COMPUTE! Publications attended the annual World of Commodore show in Toronto this past December. We set up our booth and manned it with a variety of editors, including those from our two Commodore magazines, *Amiga Resource* and *Gazette*. We had lots of magazines and disks on hand, and, based on our experience from the previous two 1989 Commodore shows, we anticipated that most of the interest would be centered around our Amiga products. Much to our surprise, there was, instead, even more interest in *Gazette* and our 64/128 disks.

Our Canadian readers, slightly more than 10 percent of our audience, never fail to amaze us with their knowledge of hardware and software, as well as their historical knowledge of *Gazette*. One of our editors, obviously impressed, told me that one Canadian reader knew more about *Gazette* than any of us did.

Our hats are off to our Canadian readers. They're a special group. The letters and suggestions we get from north of the border are usually intelligent, observant, and always gracious. Meeting with this group, if only once a year, is a real treat for us.

****

A reminder: If you'd like to offer input as to how *Gazette* can better serve you, send in the *Gazette* Readership Survey from the December 1989 issue. We read each of the responses and tabulate the results.

This is the third year we've run such a survey. Each time that we've charted the results, we've made changes in the magazine based on what you've told us. We'll do the same again this year.

The sole purpose of the survey is to see how we're doing for you, what you like and don't like, and how we can better shape the magazine for your needs. We have hundreds of responses in and tabulated (a sneak preview of the early returns is in this month's "Horizons" column), but it's not too late to write in and be counted.

Lance Elko

Lance Elko
Associate Publisher

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LETTERS to the editor

Send questions or comments to Letters to the Editor, **COMPUTE!'s Gazette,** *P.O. Box 5406, Greensboro, North Carolina 27403. We reserve the right to edit letters for clarity and length.*

The Right Joystick

I'd like to comment on the review of The Final Cartridge III [January]. Art Hunkins reported that a mouse was necessary in order to use the desktop feature of the cartridge and that joystick mode is nearly impossible. Well, Art apparently doesn't own a decent joystick. I've owned my Final Cartridge III for more than a year now, and I use an Epyx 500XJ joystick. I can tell you with great confidence that this inexpensive joystick is almost as good as using a mouse and works equally well with GEOS. Cheer up, Art . . . the rest of the article was pretty good.

Robert L. Rappaport
Key West, FL

Bad Taste?

In the past few months, I've noticed an increasing occurrence of advertising that appeals to the sensual. I understand that *Gazette* does not design the ads, and that advertising is essential to the economic survival of any magazine. It has reached the point where I am embarrassed to read my *Gazette* in public. Please share my concern with those who advertise in your magazine.

Clark Lindsay
Dunbar, WI

SpeedScript on Disk

I've found *SpeedScript* to be better than the commercial word processor I had been using. I recall that you published a spelling checker for it a few years ago. Can you reprint this? Also, I find the question "Tape or Disk?" (asked every time you want to print or save) to be a waste of time. I'll bet nearly everybody who uses *SpeedScript* has a disk drive.

F. S. A. Johnstone
Ont., Canada

We published a SpeedScript *spelling checker* (SpeedCheck) *in the December 1985 issue of* Gazette. *We also published a version for the 128* (SpeedCheck 128) *in the September 1988 issue. All 1985 issues are no longer available. The 1988 issue is, however, available.*

We recommend that you consider purchasing COMPUTE!'s SpeedScript Disk, *which contains both versions of* SpeedScript, *both spelling checkers, and a host of other support utilities for both the 64 and 128 versions. (An ad appears elsewhere in this issue.) The "Tape or Disk?" prompt is conspicuously absent in the disk version.*

Thanks to Readers

A special thanks to those readers who responded to Kristine Cipra's request for accounting-program recommendations ("Reader Advice, Please," December). Since there were a variety of responses (no one package dominated the suggestions), we have forwarded letters to Kristine.

Good Report

I've discovered that Commodore's customer support which everyone is quick to put down is really quite good. I recently wrote to Commodore about not receiving a manual and a registration card with my 1084. Within a week, I received both along with a letter of apology from a customer support person. I don't know about anyone else, but to me that's outstanding support.

Ronald W. Waid
Philadelphia, NY

Lest We Forget

Just a little nitpicking comment. In the December issue, you carried the program *80 × 50 Display*. In the article, you mentioned that the VIC-20 had a 22 × 25 character screen. It's 22 × 23. I got rid of that archaic beastie, but I still remember a lot about it.

Rod Reddekopp
Yorkton, Sask., Canada

Right you are. We used to cover the VIC quite extensively, but it seems we've got some bad memory chips here at the COMPUTE! office.

Dendrites in Dispute

The illustration for *Neural Networks* [January] is incorrectly labeled. The short, red fingerlike projections extending from the cell body are the dendrites. Their function is to carry messages from the synapses to the cell body. The blue projections, which are labeled as dendrites, are actually the ends of the axons, which carry messages away from the cell body to the synapse. Finally, the axon label, although technically correct, is actually pointing to part of the myelin sheath, which is an insulating wrap around the axon.

Craig D. Slattery
Wapakoneta, OH

Thanks, Craig—you're absolutely right.

VIC Help

I found myself in complete agreement with the reader searching for programs for his VIC-20 and Plus/4 ["Call for VIC-20 and Plus/4 Software," November]. I've been going bananas trying to find software.

To respond to the reader's direct question, I've found all of my programs at the public library. My branch carries some *Family Computing* issues and, more importantly, *COMPUTE!* and *Gazette* going back far enough to carry some VIC programs. I've also been able to receive some VIC books through the interbranch library system. Another avenue to explore is user groups. *Computer Shopper* runs a list of user groups broken down by state. Each group has in its listing the names of the computers they support. There were lots of Commodore groups listed, and at least two mentioned the VIC. I've written to some but haven't received a response yet. One more idea: If the reader has access to an IBM PC or compatible with a modem, *Computer Shopper* runs a list of BBSs by state. He could tie into one of those and find out if they carry a "For Sale" conference. Post a message asking for VIC-20 or Plus/4 equipment. Be prepared to wait for an answer, though—I'm just now getting some feedback after three months of waiting!

Also, I'd love to find some out-of-publication copies from COMPUTE!'s series of titles for the VIC.

Edward J. Rhodes
Newport, RI

Some excellent ideas here. Don't forget that in every May and June issue Gazette *publishes a comprehensive list of Commodore user groups (many with BBS numbers) as well. Incidentally, back issues of* Gazette *before 1986 are out of print, as are all the VIC titles published by COMPUTE! Books. But, we're fairly certain that some libraries will have copies of these magazines and books.* G

horizons

Computer Science

Rhett Anderson

No matter what the system—Atari 2600, Commodore 64, Nintendo, IBM PC—programs just keep getting better and better. Because I claimed lack of inspiration for this month's "Horizons," Associate Publisher (I knew him back when he was just an editor) Lance Elko suggested that I discuss this phenomenon. I liked the idea so much that I scrapped the half-column I had already written.

First, an experiment. While reading this sentence, carefully walk over to your software shelf. Don't trip over furniture, pets, or family members as you do this. Now, while reading this sentence, look out of the corner of your eye and find your first favorite game for your computer. Next, find your current favorite game.

If you're not the type to play games, this experiment also works with productivity software, but because games stretch the machine more than any other category of software, we'll be able to go further in our scientific quackery if you can nab a pair of entertainment titles.

Fire up your computer and boot the older game. Check out the title screen, the music, the graphics, the animation, the sound effects. Now try the second game and compare.

Old-timers will notice the most change—the longer the gap between the two programs, the more obvious and significant the differences.

With this experience in mind, let's take a closer look at the programmer and his or her tools.

Cold Pizza and Inspiration

Because programming is largely misunderstood by the outside world, programmers tend to run in packs. While it would be stretching the facts to say that they all walk alike and talk alike or that they all have the same diet and taste in music, they do look out for each other. Trade secrets don't last long. Programmers are anxious to brag about what they've done, so source code streams along the telecommunications wires 24 hours a day.

That's one reason programs get better. Each programmer contributes a few tricks to the taming of the machine.

Tools get better, too. One of the best tools that ever came out for designing Commodore 64 games was the Commodore Amiga. Artists draw screens, characters, and objects with the excellent Amiga paint and animation programs. Then the programmers write routines to convert the Amiga images to 64 images. While the images lose a bit in translation, they look far superior to the images created from scratch on the 64.

The Road Taken

Let's take a closer look at the 64 (the 128, from a game player's point of view, is essentially the same machine). The 64 was preceded by the Apple II, the Atari 800, and the VIC-20. It wasn't surprising to anyone when the first Commodore 64 games looked exactly like Apple, Atari, and VIC games. In fact, some of the first 64 games copied the other versions so closely that they didn't even use the 64's hardware sprites.

Soon, programmers felt their way through the 64 and began to take advantage of its considerable strengths: color memory, sprites, expansive RAM, and three-channel sound. A spate of books arrived, detailing the hardware and system software. Soon, the 64 was the most popular home computer.

For a while, programmers almost overused the 64's special talents. Often, for instance, nothing on the screen would move but the sprites. Since sprites can take up only a small percentage of the total screen area, many programs started to look the same.

To break out of the pack, programmers had to do more. With the introduction of the PC's EGA mode and the Amiga and ST computers, programmers had new goals to work toward.

The Outer Limits

Have we seen the best? What we've seen is close. The 64 has definite, unavoidable limitations. It has only 16 colors out of a palette of 16. EGA has 16 out of 64. The Amiga has 32 out of 4096. Memory is a big problem. Digitized sound samples (which pale in comparison to Mac or Amiga sound) take up huge amounts of RAM. Resolution is limited to 320 × 200. Commodore 64 disks drives are slow, and the disks don't hold much.

So, we've come close to the limit. As close as is economical, anyway. It's certain that today's games would have stunned yesterday's game players.

Ear to the Ground

The rumors of the Commodore 65—an enhanced Commodore 64—remain. Since the 128 is out of production, and the 64 is rumored to be out of production, many people see the 65 as the Commodore 8-bit line's last chance.

Many of the user group newsletters I see make mention of the 65. I myself have never seen one. I've never even talked to anyone who has seen one. If any of you have seen a 65 prototype machine, please drop me a line and tell me your story. I'll keep it confidential. If you'd like, I'll eat your letter when I'm through reading it.

My prediction on the situation: If Commodore doesn't sell enough Amigas by fall to make believers out of an increasingly skeptical marketplace, it will scale back the company, release the 65, and try to become (once again) everyone's favorite low-end computer maker.

Sneak Preview

I've managed to sneak a look at some of the early returns of the 1989 Readership Survey.

Some of your responses surprised me. For instance, more than 90 percent of you use the programs published in *Gazette*. The majority of you type them in. That's encouraging. When asked to rate the quality of our programs, most of you gave us an 8, a 9, or a 10 (out of 10).

Most of you want to hang on to your current computers. Of those who want to buy a new one in the next year, most want an Amiga (37 percent). Next come the PC (28 percent) and the 128 (19 percent).

Well, I'll stop pulling my material out from under the editor. I'm sure you'll find out more about the survey when the final results are in.

Old Business

Alan Shotzbarger from Solon, Ohio (I've actually eaten at a McDonald's there, Alan), wrote to tell me that he votes in favor of voting by computer. He believes that our method of democracy could use an overhaul. He says "By allowing computerized voting, every individual would have the opportunity to be heard equally." **G**

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d'iversions

Classrooms of Tomorrow

Fred D'Ignazio

Over the past few months, I've received hundreds of letters from *Gazette* readers as part of The Great Commodore/Nintendo Debate. The letters have been outstanding. Encouraged by the quality of your responses, I've decided to turn to you for advice on a project I'm involved with here in Michigan.

I'm working with high-level state officials in Michigan to create a program that will be called Michigan Classrooms of Tomorrow. Michigan teachers who sign up for the program will get $20 million worth of computers for their classrooms. To qualify, the teachers will have to show how they will use the computers to create a classroom of tomorrow. The computers will help teachers try out new methods of teaching and learning that will prepare their students for the twenty-first century as citizens, parents, and workers.

New Strategies

Here are some of the strategies Michigan teachers can explore with their students, using computers:

• Cooperative Learning. Students work as teams. They help each other learn and don't let anyone fall behind. The teams solve problems together, create class speeches, and demonstrate what they've learned using the computer.

• Critical Thinking. Teachers turn over the responsibility for learning to their students. The students gain a lot of independence and get to make a lot of their own decisions. However, they must be more self-reliant, manage their classwork and homework, and solve a lot of problems on their own. They use a computer to help them work.

• Classroom Publishing. Students choose projects that have a natural audience—parents, younger students, senior citizens, and so on. They research a subject, gather materials, and create publications using their computer. The publications might be on disk, audiotape, videotape, or paper (like a class newspaper or flyer).

• Apprentice Learning. Students take on the role of apprentice teachers. They learn how to read, write, do math, and study geography the way a teacher does—so they can share their new knowledge with their classmates. Students are graded not by what they know, but by how well they share what they know with others.

• Thematic Teaching. Students no longer study one subject at a time. Now they try to see connections between math and reading or between history and science. They learn subjects as part of larger thematic units such as whales, the greenhouse effect, homeless people, technology, religion, migration, and so on. They learn how to use the tools of science, math, and so on, to interpret information and share it with others.

A New Kind of Classroom

What will a classroom look like in the year 2000?

That used to be a question asked only by futurists and crystal-ball gazers. Now it's a question for all of us. The year 2000 is only ten years away.

I've made a futuristic proposal to Michigan educational officials. In the year 2000, I said, students won't learn from textbooks or teachers. Textbooks contain warmed-up, leftover knowledge that is largely outdated. Teachers can't keep up with knowledge on all fronts or with the tools that can deliver knowledge to their students—tools like computers, laserdiscs, satellite TV, compact discs, compressed video, fiber optics, and so on.

In the year 2000, teachers and students will learn together as knowledge explorers. They'll choose topics pulled from current events, family life, and local politics. And they'll send student and teacher teams out into the real world on electronic field trips to investigate these topics as they gain practice with tools for investigation including statistics, reading, writing, the scientific method, and graphic arts.

Education in the year 2000 will be a lot like a good computer game. A student on an electronic field trip will still be sitting in the classroom, but he or she will also be an electronic *telepresence,* able to use electronic eyes and ears and journey around the globe, explore the seas, or blast off to a distant planet or moon—*just like a character in a computer game!* Student workstations will be like flight simulators used by NASA's astronauts and commercial airline pilots. Information will be displayed in various windows on the computer screen—animation windows, number windows, text windows, and so on. Student explorers will interview scientists, experts, policymakers, and other decision makers. They will turn their interviews into computer games and get practice solving real-world problems and searching for solutions to the same problems that are stumping the experts.

Help!

This is the proposal that I made to Michigan officials as part of their Classrooms of Tomorrow program. We need to work toward tomorrow, I said, by starting today. We need to look at the best computer games and see how they can be transformed into powerful learning experiences that turn students on to learning, help them link together the continents of knowledge, and carry them into the twenty-first century.

But I'm no gamer. I depend a lot on my 10-year-old son, Eric, and my 13-year-old daughter, Catie, to advise me, but I need more help. A lot more.

If you play computer games and would like to help the state of Michigan plan its classrooms of tomorrow, please write me. Tell me how we can use computer gaming techniques in the classroom to help students learn their subjects. What powerful learning skills do games develop? How can these skills be used in classroom learning?

Be specific. Diagram a map of the classroom of tomorrow and show me how the students are grouped, what equipment is used, and so on. What does the school day look like? Is it divided into periods as it is now, or is it centered around students' projects?

Read this article again; then jot down your ideas, pictures, suggestions, and so on, and send them to

Fred D'Ignazio
c/o COMPUTE!'s Gazette
324 W. Wendover Ave.
Suite 200
Greensboro, NC 27408

I'll publish the most innovative ideas in an upcoming column. And, thanks! Kids all over Michigan will benefit from your thinking. **G**

power BASIC

BASIC Labels

Ancel Bhagwandeen

Branch to labeled subroutines with this short but powerful enhancement for BASIC 2.0.

Commodore 64 BASIC is a good general-purpose language, but it lacks a certain feature offered by many languages. Specifically, it won't allow you to branch to labeled routines. Instead of being able to use meaningful labels such as CHECKFORINPUT or BUILDSCREEN, you're forced to use obscure line numbers.

BASIC Labels is a machine language routine that gives BASIC 2.0's GOSUB and GOTO statements the ability to branch to labels. With it, you no longer have to guess where an unwritten subroutine will begin. Just give it a label and the line number becomes irrelevant.

Furthermore, with *BASIC Labels* you can branch to the middle of a program line. Normally, the GOSUB and GOTO commands transfer program control to the start of a designated line. Now, you can position a label at any point within a line and execution will begin there. This added flexibility is especially convenient when working with loops and subroutines.

Getting Started

Since *BASIC Labels* is written entirely in machine language, you'll need to enter it using *MLX*, the machine language entry program found elsewhere in this issue. When *MLX* prompts you, respond with the values given below.

Starting address: CEA4
Ending address: CFFB

Follow the *MLX* instructions carefully. Before you exit *MLX*, be sure to save a copy of the program to disk with the name BASIC LABELS.

Next, type in the BASIC program Demo. To ensure accurate typing, enter this program using *The Automatic Proofreader*, also found elsewhere in this issue. When you've finished typing, be sure to save a copy of the program.

Using the Program

The program Demo shows you how to use *BASIC Labels* in your own programs. To load the machine language, place a statement of the form

```
10 IF A=0 THEN A=1:LOAD"BASIC
   LABELS",8,1
```

at the beginning of your program. Then type SYS 52900 to enable the routine.

With *BASIC Labels*, each label must begin with a letter and can contain as many as 20 alphanumeric characters. A left square bracket ([) must precede each label at the point of execution. If you forget to include this character, a syntax error will occur. (BASIC tries to interpret the label itself as a command.) Also, be careful if you use a left square bracket within quotation marks. A string containing this character could be mistaken for a label if the subsequent characters match those for a label.

A colon (:) is used to mark the end of each label. Don't place a space between the end of the label and the colon unless you want it to be part of the label. When branching, refer to the label by its exact name; don't include the bracket or the colon (for example, GOSUB GETINPUT).

One caveat: Although *BASIC Labels* is fully functional with GOTO and GOSUB, with the ON GOTO/ON GOSUB statements only the last branch line number can be replaced by a label (for example, ON *x* GOTO 10,20,30, LABEL).

BASIC Labels

```
CEA4:AD 00 03 8D C7 CE AD 01 28
CEAC:03 8D C8 CE A9 BB 8D 00 8C
CEB4:03 A9 CE 8D 01 03 60 E0 A6
CEBC:11 F0 0A E0 0B D0 03 4C 5C
CEC4:C6 CF 4C FF FF A0 01 A5 6D
CECC:7A 8D DC CE 8D 97 CF A5 A3
CED4:7B 8D DD CE 8D 98 CF AD 58
CEDC:FF FF F0 15 C9 3A F0 11 14
CEE4:99 ED CF 8C EA CF C8 EE A4
CEEC:DC CE D0 EB EE DD CE D0 E2
CEF4:E6 A9 5B A0 00 99 ED CF F7
CEFC:A0 04 A2 00 A5 2B 85 A3 C8
CF04:A5 2C 85 A4 B1 A3 F0 1B 95
CF0C:DD ED CF F0 09 A2 00 C8 BA
CF14:D0 F2 E6 A4 D0 EE EC EA 07
CF1C:CF F0 3E E8 C8 D0 E5 E6 72
CF24:A4 D0 E1 C8 D0 02 E6 A4 14
CF2C:B1 A3 F0 1F 20 49 CF 20 83
CF34:49 CF B1 A3 8D E8 CF 20 AC
CF3C:49 CF B1 A3 8D E9 CF 20 B8
CF44:49 CF 4C 08 CF C8 D0 02 CB
CF4C:E6 A4 60 C8 D0 02 E6 A4 22
CF54:B1 A3 D0 DB A2 11 4C C6 46
CF5C:CE 20 49 CF B1 A3 C9 3A 7B
CF64:D0 B9 98 18 65 A3 8D EB 30
CF6C:CF A9 00 65 A4 8D EC CF B9
CF74:CE EA CF 18 AD EA CF 65 CF
CF7C:7A 85 7A A9 00 65 7B 85 B6
CF84:7B 38 AD 97 CF E9 01 8D D4
CF8C:97 CF AD 98 CF E9 00 8D DE
CF94:98 CF AD FF FF C9 89 F0 55
CF9C:06 C9 8D F0 1D D0 E2 20 84
CFA4:A9 CF 6C 08 03 AD EB CF 91
CFAC:85 7A AD EC CF 85 7B AD 6B
CFB4:E8 CF 85 39 AD E9 CF 85 3B
CFBC:3A 60 68 68 20 A9 CF 6C D8
CFC4:08 03 A0 00 B1 7A C9 5B A3
CFCC:F0 05 A9 0B 4C C6 CE C8 EF
CFD4:68 68 68 68 B1 7A F0 E7 97
CFDC:C9 3A F0 E3 E6 7A D0 F4 04
CFE4:E6 7B D0 F0 00 00 00 00 FF
CFEC:00 00 00 00 00 00 00 00 8C
CFF4:00 00 00 00 00 00 00 00 94
```

Demo

```
SG 10 IFA=0THENA=1:LOAD"BASIC
      {SPACE}LABELS",8,1
MK 20 SYS52900
DG 30 PRINT"{CLR}";TAB(3)"COPY
      RIGHT 1990 COMPUTE! PUB.
      , INC."
EM 40 PRINTTAB(10)"ALL RIGHTS
      {SPACE}RESERVED":PRINT:P
      RINT
HE 50 PRINTTAB(3):PRINT"THE LI
      NE NUMBER OF EACH BRANCH
       IS"
PA 60 PRINTTAB(4):PRINT"DISPLA
      YED AS IT EXECUTES BELOW
      {YEL}":PRINT:PRINT
GR 70 GOSUB LABEL:GOSUB LABEL1
      :GOSUB CCC
SB 80 GOSUB DDD:GOTO A LONG LA
      BEL
DR 90 THIS PART OF LINE WILL N
      OT BE USED:[LABEL:GOSUB
      {SPACE}DDD:PRINT"110":RE
      TURN
MS 100 [LABEL1:PRINT"120":RETU
       RN
PQ 110 [CCC: PRINT"130":RETURN
XX 120 [DDD:PRINT"140":[EEE:RE
       TURN
SC 130 [A LONG LABEL:GOSUB150:
       PRINT"END"
CS 140 END
HQ 150 PRINT:PRINTTAB(2)"{7}YO
       U CAN USE NORMAL BRANCH
       ES AS WELL"
SC 160 PRINTTAB(8)"(GOTO 20, F
       OR EXAMPLE)":RETURN
```

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THE programmer's page

Hints and Tips

Randy Thompson

"The Programmer's Page" is interested in your programming tips and tricks. Send all submissions to The Programmer's Page, COMPUTE!'s Gazette, *P.O. Box 5406, Greensboro, North Carolina 27403. We'll pay $25–$50 for each tip we publish.*

This issue's hints and tips range from a technique to put you in 64 mode on the 128 to one for creating colorful listings.

Go Directly to 64 Mode

Normally, to go into 64 mode on a 128, you type GO 64, hit RETURN, and then answer Y to the ARE YOU SURE? prompt. But if you type SYS 65357 instead, you go directly to 64 mode. The ARE YOU SURE? prompt does not appear. You can use this SYS from within a program as well.

Ali Imran
Lahore, Pakistan

Decimal to Hexadecimal Chart

This program prints a hexadecimal lookup chart for the decimal numbers 0–255. It prints the numbers in five neatly aligned columns. Such a chart is useful when you're programming in machine language or whenever you need to convert a number from hexadecimal to decimal or vice versa.

```
GP 100 REM DECIMAL TO HEX CONV
       ERSION CHART
DH 110 HIGH=255:REM UPPER LIMI
       T
DS 120 OPEN 4,4:X=1:Y=1:SP$="
       {SPACE}$"
PF 130 PRINT#4,SPC(20)"DECIMAL
        TO HEX CONVERSION CHAR
       T":PRINT#4:PRINT#4
RE 140 D=X:GOSUB 200:REM CONVE
       RT TO HEX
MX 150 X$=RIGHT$(STR$(1000+X),
       3):HX$=RIGHT$(HD$,2)
DQ 160 PRINT#4,TAB(5);" ";X$;S
       P$;HX$;
JG 170 X=X+1:Y=Y+1:IF Y=6 THEN
        Y=1:PRINT#4
PF 180 IF X<=HIGH THEN 140
PS 190 PRINT#4:CLOSE 4:END
CA 200 HD$="":D=D/4096:FOR I=1
        TO 4:D%=D:HD$=HD$+CHR$
       (48+D%-(D%>9)*7):D=16*(
       D-D%)
PS 210 NEXT
CD 220 RETURN
```

If you want this program to print numbers higher than 255, change the variable HIGH in line 110 to reflect the new upper limit.

Henry E. Shotwell
Berwick, PA

REMarkable Codes

It's a little-known fact that you can use the REM statement to change the appearance of your BASIC program listings. Both the 64 and the 128 will process control codes that follow a REM, forcing the computer to perform tasks such as changing the text color, clearing the screen, moving the cursor, and even emitting a beep (128 only).

To enter these codes, you must type REM, enter two quotation marks, hit DEL once (to remove the second quotation mark), press CTRL-9 (for RVS/ON), and then press SHIFT-M. Your line should appear with a single quotation mark followed by a reversed backslash character. Now, you may follow this backslash with one or more of the characters shown in the accompanying table to create a variety of effects. All of these control characters must be entered in reverse mode.

For example, enter a program line with a REM, type two quotation marks, DEL, CTRL-9, and SHIFT-M to prepare for the control codes; then enter two Q's (unshifted), press CTRL-0 to exit reverse mode, type 13 spaces and the word COMMODORE, press CTRL-9 to enter reverse mode again, and then enter one last Q. Now, when you list the line you'll see

```
10 REM "
                COMMODORE
READY.
```

The first quotation mark that you type is used to hold the characters; the second quotation mark turns off quote mode but is deleted so that the computer remains in quote mode when the line is listed. The CTRL-9 doesn't print any characters but activates reverse mode. The reverse shifted M is equivalent to a shifted RETURN (ASCII 141). The reversed Q's are cursor downs. If you've ever typed a cursor down in quote mode, you know that the computer prints a reversed Q.

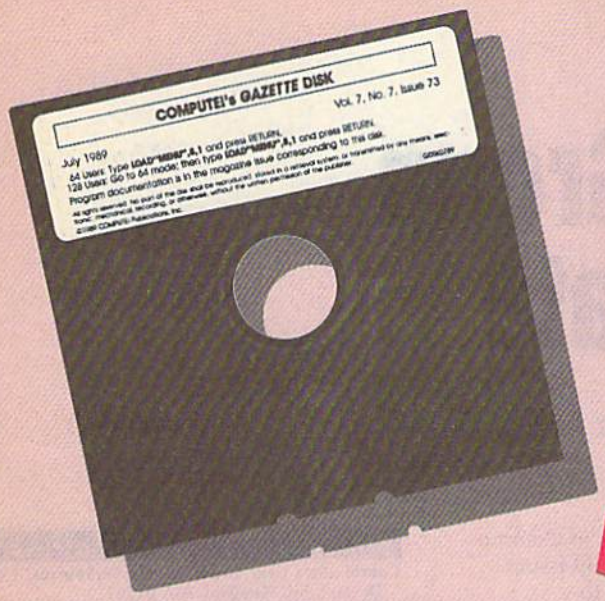
To print normal characters in your listing, simply exit reverse mode by pressing CTRL-0. Remember to turn reverse back on, however, to enter the codes listed in the following table.

Character-Code Keypress	Function
]	cursor right
SHIFT-–	cursor left
SHIFT-Q	cursor up
Q	cursor down
S	home cursor
SHIFT-S	clear screen
T	delete
SHIFT-T	insert
R	reverse on
SHIFT-R	reverse off
SHIFT-P	black
E	white
£	red
CMD-*	cyan
CMD-–	purple
↑	green
←	blue
SHIFT-↑	yellow
SHIFT-A	orange
SHIFT-U	brown
SHIFT-V	light red
SHIFT-W	dark gray
SHIFT-X	medium gray
SHIFT-Y	light green
SHIFT-Z	light blue
SHIFT-+	light gray
B	underline on (80-column only)
SHIFT-B	underline off (80-column only)
G	ring bell (128 only)
SHIFT-M	shifted return
N	lowercase characters
SHIFT-N	uppercase characters
O	flash on (80-column only)
SHIFT-O	flash off (80-column only)
I	tab (128 only)
X	set/clear tab (128 only)
[	escape

Instead of using the characters given above, you can also enter control codes as normal keypresses. To do this, you must enter a quotation mark directly after the shifted M and press DEL to remove it. This puts you back into quote mode, where you can enter the control codes simply by pressing the appropriate key. For example, to enter a cursor-down character (which appears as a reverse Q), simply press the cursor-down key. Or to enter a color change, simply hold down CTRL and press one of the number keys.

Abhay Saxena
Glen Oaks, NY

G



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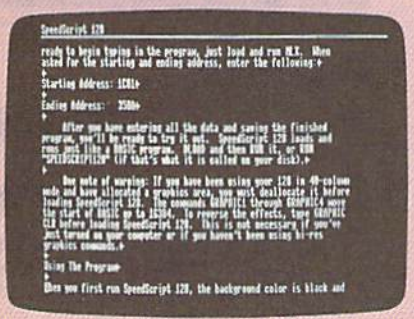

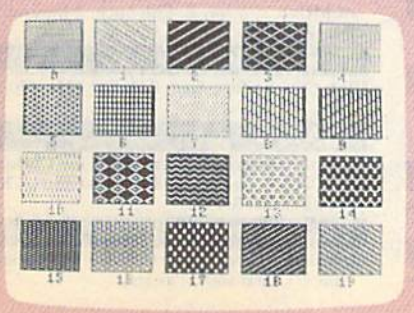

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User Group Update

Edited by Liz Casey

The following list includes updated entries to our annual "Guide to Commodore User Groups," which last appeared in the May and June 1989 issues.

Send typed additions, corrections, and deletions for this list to

Commodore 64/128 User Group Update
COMPUTE!'s Gazette
P.O. Box 5406
Greensboro, NC 27403

When writing to a user group for information, please remember to enclose a self-addressed envelope with postage that is appropriate for the country to which you're writing.

Note: COMPUTE! Publications does not condone the use of its user group lists by individuals or user groups for the purpose of buying, selling, or trading pirated software. Should we discover any group participating in any such illegal and unethical activity, the club's listing will be permanently deleted from our files.

User Group Notes

The **Blue Juniata Commodore Users-Group** has changed its mailing address. The correct mailing address is 23 Oakland Avenue, Lewistown, Pennsylvania 17044.

The correct bulletin board service telephone number for **Commodore Users Group of Kansas City** (P.O. Box 36034, Kansas City, Missouri 64111) is (816) 353-9961.

The **Queens Commodore Users Group (QCUG)** has moved. Its new mailing address is P.O. Box 129, Ozone Park, New York 11417. The group has also added a bulletin board service; the number is (718) 366-7445.

The **Tulsa Area Commodore Users Group (TACUG)** has changed its mailing address. All correspondence should be sent to P.O. Box 52473, Tulsa, Oklahoma 74152-0473. Its new bulletin board service number is (918) 428-2284.

The Scranton Commodore Users Group in Scranton, Pennsylvania has changed its bulletin board service number. The correct telephone number is now (717) 969-1228.

The Muenster Garrison User's Group has updated its mailing address. The new address is c/o Mr. Maki, 583rd Ord Co., APO New York, NY 09078.

New Listings

ARIZONA

Prescott Area Commodore Club (P.A.C.C.), P.O. Box 4019, Prescott, AZ 86301

CALIFORNIA

Commodore 64 West User Group, 2306 W. 180 St., Torrance, CA 90504

Temple City Commodore Users Group (TCCUG), 9317 E. Olive St., Temple City, CA 91780

Commodore Computer Club, 55 Beverly Dr., Camarillo, CA 93010

COLORADO

Colorado Plus Four Forum, 1340 Fillmore St., Denver, CO 80206

GEORGIA

Metro Atlanta Commodore Klub (MACK), P.O. Box 813481, Smyrna, GA 30081 (BBS# 404-590-7114)

IOWA

Commodore Computer User's Group of Iowa (CCUGI), P.O. Box 3140, Des Moines, IA 50316

LOUISIANA

West Bank Users Group, P.O. Box 740854, New Orleans, LA 70174-0854

MASSACHUSETTS

Commodore User Group of the Berkshires, 159 Dorreen St., Pittsfield, MA 01201

NEW JERSEY

Fair Lawn Computer Club, c/o Herman Sachs, 6 Bryson Rd., Fair Lawn, NJ 07410

NORTH CAROLINA

Western Carolina Commodore Beginner User Group (WCCBUG), Rt. 4 Box 387, Forest City, NC 28043 (BBS# 704-287-8052)

Greater Onslow Commodore Users Group (GOCUG), P.O. Box 1644, Jacksonville, NC 28541

OHIO

Western Cincinnati Commodore Club (WESTCOM 64), P.O. Box 89, Amelia, OH 45102

TENNESSEE

Chattanooga Commodore Users, 1406 Blackwell Dr., Chattanooga, TN 37412

TEXAS

The Software Palace, 11200 Socarro Rd., El Paso, TX 79927 (BBS# 915-859-8714)

WASHINGTON

Renton Computer Group, 11308 SE 269th St., Kent, WA 98031

Yakima Area Commodore Club, P.O. Box 10937, Yakima, WA 98909-1937

WISCONSIN

Excaliber 64/Amiga, Rt. 3 Box 30-AA, Cumberland, WI 54829

Outside the U.S.

AUSTRALIA

C64 Computer User, P.O. Box 826, Young, New South Wales 2594, Australia

CANADA

Calgary Commodore Users Group, 37 11810 Macleod Tr. SE, Calgary, Alb., Canada T2J 2V8

Commodore User's Group of Saskatchewan (C.U.G.S.), 1752 Forget St., Regina, Sask., Canada S4T 4Y5

Ottawa Commodore Microcomputer User Group (CMUG), c/o Mr. Z. Colynuck, 2 Kingsmill St., Nepean, Ont., Canada K2E 5J1

COSTA RICA

Club Commodore Tico, P.O. Box 4356-1000, San José, Costa Rica

MEXICO

Club de Usuarios Commodore de Chihuahua (CUCC), R. Calderon #801, Chihuahua, Chihuahua, Mexico 31240

PAKISTAN

Commodore User Group (C.U.G.), 465-C, Satellite Town, Gujranwala, Pakistan

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feedback

Do you have a question or a problem? Have you discovered something that could help other Commodore users? We want to hear from you. Write to Gazette Feedback, COMPUTE!'s Gazette, P.O. Box 5406, Greensboro, North Carolina 27403. We regret that, due to the volume of mail received, we cannot respond individually to programming questions.

Video Digitizers

I'm interested in a video digitizer for my Commodore 64. I know of two such products: ComputerEyes and Video Byte. Could you tell me a little more about each of these?

Art Green
Pembroke Pines, FL

Video digitizers take output from a VCR or a video camera and convert it into a high-resolution bitmapped image. ComputerEyes is an established product and costs $129.95. It takes about six seconds to produce a gray-scale image in Doodle *or Koala format.*

Video Byte II is newer and features faster scanning and color support. Files are saved in Koala format. Color printing is supported with the Super Explode! version 5 cartridge. The digitizer costs $79.95, and the Super Explode! 5 cartridge is $44.95. For more information on ComputerEyes, contact Digital Vision, 66 Eastern Avenue, Dedham, Massachusetts 02026; (617) 329-5400. If you'd like to know more about Video Byte II and Super Explode! 5, contact The Soft Group, P.O. Box 111, Montgomery, Illinois 60538; (312) 851-6667.

A BIT Confusing

Recently, I was converting a VIC-20 machine language program to work on a C64 and ran across the following subroutine.

```
8000  LDA   #$05
8002  BYTE  $2C
8003  LDA   #$01
8005  STA   $033C
8008  RTS
```

After SYSing to it, I PEEKed location 828 to see what value was stored there. In every instance, location 828 holds 5, the first value loaded into the accumulator. Why is this? Shouldn't the second value, 1, be the number stored in 828? It appears that the code for BYTE $2C (decimal 44) has something to do with what's happening here, but I can't figure out why. Can you help?

Matt Bathke
El Cajon, CA

We can see why you're confused. It seems that location $033C should contain a 1 each time you call the subroutine, but it doesn't. The problem is that the subroutine can be disassembled in two ways. The disassembly above is one way to look at the subroutine; below is another.

```
8000  LDA   #$05
8002  BIT   $01A9
8005  STA   $033C
8008  RTS
```

Now, you can see why location $033C contains 5 when the subroutine ends. The BIT command at location $8002 ANDs the contents of the accumulator with the contents of location $01A9 and sets the status register accordingly. It also copies bit 7 of $01A9 to the N (negative) flag of the status register and bit 6 to the V (overflow) flag. Unlike the AND command, the BIT command doesn't change the contents of $01A9 or the accumulator.

The BIT command was originally intended to be used to read I/O registers without losing the contents of either the register or the accumulator. Another popular use of the BIT command is to allow multiple entry points into a subroutine. In the subroutine above, if you enter at $8000, location $033C contains a 5 when the subroutine exits. If you enter at $8003, location $033C contains a 1. If you're interested in learning more about the BIT command, watch for the July and August installments of "Machine Language Programming," where Jim Butterfield explains how the BIT command works and some of its more common uses.

A Matter of Timing

Owners of older 64s (mine was manufactured and sold in 1982) should be aware that the original version had design errors in both the hardware (TOD) and software (jiffy) clocks.

A TOD (time-of-day) clock is implemented within each 6526 chip. Although BASIC on the 64 doesn't use this function, some third-party software does, including Berkeley's GEOS. The fault is in the circuit that generates the 60 PPS (power-line frequency) pulses for the 6526s, causing them to count at two to three times the correct rate. In my 64, this condition persisted for about half an hour after the power was turned on, depending on what was plugged into the expansion port. The fault can be cured by soldering a 0.1 µfd ceramic capacitor across R37 (6.8K), located to the right of U27 on the motherboard, and another 0.1 ufd ceramic capacitor across CR1 (1N4371), located near the center of the board.

BASIC on the 64 generates the jiffy clock (TI$) by counting IRQ pulses, which originate in Timer A of 6526 #1 at a nominal rate of 60 PPS. This counter counts at the system (CPU) clock rate of 1.023 MHz. In the original software, the Timer A divisor is 16667 decimal, which is correct for a 1.000-MHz clock. Hence, the jiffy clock runs 2.3 percent fast, gaining an extra minute every 45 minutes, or 33 extra minutes per day.

This error can be corrected by writing the proper divisor (17045 decimal) into the Timer A latches before setting TI$. To do this, include one of the following patches in your program's initialization routine.

(in machine language)

```
LDA  #$95
STA  $DC04
LDA  #$42
STA  $DC05
```

(in BASIC)

```
POKE 56324,149:POKE 56325,66
```

The timer latches are write-only; you cannot read the values in them. In later 64s, these patches have no effect on the computer since they simply rewrite the same (correct) values already in the latches.

Alex Engel
La Canada, CA

Thanks for this enlightening discussion on the 64's clocks. Soldering on a circuit board is a delicate operation and therefore we suggest that only qualified readers attempt to make the hardware modifications. You can determine whether you need to use the software modification with your computer by PEEKing location 65408. The oldest 64s have a 170 in this location. If you have one of the oldest 64s, you should use the software patch suggested above in any program that uses the 64s clocks. As Mr. Engel suggests, you can safely use the patch on all 64s. **G**

BASIC for beginners

AND, OR, and NOT

Larry Cotton

This month we'll cover three more lesser-known commands—including one I haven't used in over seven years of BASIC programming. They are the logical functions AND, OR, and NOT. The two most useful in this group are AND and OR, so we'll look at them first.

Type the following line and press RETURN:

```
PRINT 1 AND 1
```

It seems that 1 AND 1 is not the same as 1 plus 1. But why not? AND and OR are inextricably associated with the concept of bits and bytes, so let's take the time—never before undertaken in this column—to grasp this.

As most of you probably know by now, most older computers are 8-bit machines (the 64 and 128 fall into this category). Every character on the keyboard and each BASIC keyword is represented by eight bits, or one *byte*. A *bit* is the smallest piece of information a computer can recognize. It can be either on or off, true or false, yes or no, or plus or minus. But most often, it's 1 or 0. Thus, the letter *A* is represented

0 1 0 0 0 0 0 1

This string of *binary* digits forms the binary number 01000001, which equals the *decimal* number 65. It's also a byte (or *word*) of eight bits. Think of each of the digits above, which can be only 0 or 1, as falling in a particular column, headed by a number.

To determine the binary number's decimal equivalent, just add all the column-head values where a 1 is showing in that column:

128	64	32	16	8	4	2	1	
0	1	0	0	0	0	0	1	= 65

Each bit falls into a particular position in the row and has a value twice that of the bit just to the right of it. The 1 under both the 64 and the 1 mean that these two bits are *on*, while all the bits having a value of 0 are *off*. If all the bits were on, the sum would be 255, the highest number that any one byte can represent.

Recall that 255 is the largest number that can be POKEd to a memory location. Now we know why. When POKEing a number, say, the decimal number 57, to a particular memory location, we are turning on the bits 32, 16, 8, and 1:

128	64	32	16	8	4	2	1	
0	0	1	1	1	0	0	1	= 57

Here are some other decimal numbers and their binary equivalents:

128	64	32	16	8	4	2	1	
0	0	1	0	0	1	1	0	= 38
0	0	0	0	1	1	1	0	= 14
1	0	0	0	0	0	0	0	= 128

Try a few yourself. What are the binary equivalents of 26? of 45? of 12? What are the decimal equivalents of 00010000? of 11011001? of 00111100?

Decimal to Binary Conversion

Here's a short program, which we'll analyze line by line, that converts decimal numbers to binary. Conveniently, it also uses AND, OR, and SGN (covered in last month's column).

```
10 INPUT"{CLR}{DOWN} DECIMAL
   NUMBER";D
20 IF D<0 OR D>255 THEN RUN
30 PRINT"{DOWN}"D"= ";
40 FOR I=7 TO 0 STEP -1
50 X=D AND 2↑I
60 Q=SGN(X)
70 PRINT"{LEFT}"Q;
80 NEXT
90 PRINT:END
```

Line 10 gets the decimal number from the user. Line 20 uses OR to weed out any numbers less than 0 or greater than 255. (See "OR," below, for more on this.) Line 30 prints the decimal number and an equal sign. Here's where ANDing is used; line 40 begins a FOR-NEXT loop that ANDs the input decimal value with eight values, one at a time. Those values are 128, 64, 32, 16, 8, 4, 2, and 1, which should look familiar.

Those values are calculated by sequentially taking 2 to the powers 7 through 0. Two to the seventh power (2 times itself seven times) is 128, 2 to the sixth power is 64, and so on. Two to the power 0 is 1 (any number to the power 0 is 1).

Each bit of a byte is numbered *right to left* from 0 to 7:

7 6 5 4 3 2 1 0

Thus, 2 raised to the power of each of these numbers yields our bit values:

128 64 32 16 8 4 2 1

Best of all, by sequentially ANDing the input decimal number with the above numbers from left to right, you can see which of the bits is 1, or on.

Let's say you want to convert decimal 35 to a binary number. Line 40 first assigns I a value of 7. In line 50, 35 is ANDed with 2 to the seventh power (128). Here's how to manually AND 35 and 128:

128	64	32	16	8	4	2	1	
0	0	1	0	0	0	1	1	= 35
1	0	0	0	0	0	0	0	= 128
0	0	0	0	0	0	0	0	= 0

The first row contains our bit values. The second and third rows are the problem rows, which contain the binary equivalents of the two numbers that we are ANDing. The fourth row contains the answer to the binary ANDing. In order for a 1 to pop up in the answer row, a column must contain a 1 in *both* problem rows. Since none of the columns do, our answer to 35 AND 128 is 0.

Of course, one can use PRINT to AND two numbers:

```
PRINT 35 AND 128
```

If you enter this and press RETURN, you'll see 0 as the result. Before we continue with the program, let's AND 35 and 32:

128	64	32	16	8	4	2	1	
0	0	1	0	0	0	1	1	= 35
0	0	1	0	0	0	0	0	= 32
0	0	1	0	0	0	0	0	= 32

Now both problem rows contain a 1 under 32, causing a 1 to pop up in the answer row. Thus, 35 AND 32 is 32.

Back to the Program

Line 60 uses SGN to evaluate the sign of X, the result of ANDing. Recall from last month that SGN(0) yields 0 and SGN of any positive number yields 1. Therefore, if X is a positive number (it really doesn't matter what its value is), Q will be 1; if X is 0, Q will be 0.

All that's left to do is to print, in line 70, a string of *Q*'s to form the binary number. Be sure to enter the semicolon at the end of line 70. The left cursor just squeezes the numbers a bit closer together.

Line 80 completes the FOR-NEXT

loop. Control goes back to line 40, I becomes 6, D is ANDed with 64 (2 to the sixth power), and so on. Line 90 moves the cursor down a line and ends the program.

Any number of values can be ANDed at once. Let's do one more AND exercise by ANDing 6, 11, and 47:

128	64	32	16	8	4	2	1	
0	0	0	0	0	1	1	0	= 6
0	0	0	0	1	0	1	1	= 11
0	0	1	0	1	1	1	1	= 47
0	0	0	0	0	0	1	0	= 2

Only under the 2's column do *all* the problem rows contain a 1. Thus, 6 AND 11 AND 47 equals 2. Confirm this by typing PRINT 6 AND 11 AND 47 and pressing RETURN.

OR

OR works in a similar way, but only one problem row has to contain a 1 in each column in order for a 1 to appear in the answer row. Here's how 8 OR 2 looks:

128	64	32	16	8	4	2	1	
0	0	0	0	1	0	0	0	= 8
0	0	0	0	0	0	1	0	= 2
0	0	0	0	1	0	1	0	= 10

When we OR two numbers, if *either* of the bits in a column is 1 (turned on), the answer bit must be 1. A 1 pops up in the 8 and 2 columns. We then add 8 and 2 in the normal way, getting 10. Thus, 8 OR 2 is 10. Very strange, but very true.

Using AND and OR

How can we put all this to work for us in BASIC programming? Actually, we only occasionally need to AND or OR numbers together. More often, we use AND and OR with IF-THEN statements such as we've already seen. If you haven't entered the entire program above, at least enter these two lines and RUN them:

```
10 INPUT"{CLR}{DOWN} DECIMAL
   NUMBER";D
20 IF D<0 OR D>255 THEN RUN
```

What do these lines do? Type a few values at the prompt, such as 0, 35, 900, and R. You'll soon see that a statement like the one in line 20 can weed out extraneous numbers and letters you don't want the user to enter. In this case, the user can enter any number in the range 0–255, inclusive, but nothing else.

Here's a way to use AND:

```
10 PRINT"DO YOU WANT TO
   CONTINUE (Y/N)?"
20 GET A$:IF A$<>"Y" AND A$<>"N"
   THEN 20
30 IF A$="N" THEN END
40 (program continues here)
```

Recall that <> means "not equal to." Using these or similar lines will ensure that the only time the program progresses beyond this point is when the user presses Y or N at the question.

AND and OR are also used to turn one or more bits on or off within a particular memory register, especially if you don't know which bits are already on. For instance, memory register 53265 on the Commodore 64 normally contains the number 27. To switch the computer into its high-resolution mode, you must turn on bit 5 in this register. To do this, you'd enter

```
POKE 53265,PEEK(53265) OR 32
```

To turn bit 5 off and thus return to text mode, you'd enter

```
POKE 53265,PEEK(53265) AND 223
```

If you're interested in learning more, the *Commodore 64 Programmer's Reference Guide* contains a number of examples that use AND and OR to modify the bit values in a byte.

NOT Much Value

The last logical function we'll mention is NOT. The *Commodore 64 Programmer's Reference Guide* states, "The NOT logical operator 'complements' the value of each bit in its single operand, producing an integer 'twos-complement' result." Not very clear! Actually, NOT makes true statements false and false statements true. For example, IF NOT (A = 5) THEN GOTO 912 means if it's not true that A = 5, then go to line 912.

Occasionally, you'll see NOT operating on a numeric variable, usually within a POKE statement. When used this way, NOT takes a number, reverses the sign, and then subtracts 1. If you enter PRINT NOT 7, you'll see −8.

I've written many BASIC programs and have yet to use NOT. I did run across some examples years ago, but I've lost them. If any of you would like to share your experiences with NOT, *in a clear fashion*, I would be happy to share them with others in a future column.

Incidentally, you can AND, OR, and NOT numbers from −32768 to 32767. **G**

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THE geos column

Calendar

Richard A. Rardin

Note important dates and times with this desk accessory for GEOS and GEOS 128, versions 1.3 and higher.

If you're like most computer users, time just slips away while your fingers dance upon the keys. You often get caught up in what you're doing and forget about meetings, birthdays, and other important dates. Wouldn't it be nice if your computer would remind you?

Calendar lets you record important dates and times and then displays them so that you can look them up quickly and easily. In addition, *Calendar* is a desk accessory, so it doesn't matter whether you're working on the deskTop, creating a work of art in *geoPaint* or formatting a newsletter with *geoPublish; Calendar* is always available.

Typing It In

Calendar is written in machine language, so you'll need to use *MLX*, the machine language entry program found elsewhere in this issue, to type it in. The *MLX* prompts, and the values you should type in, are as follows:

Starting address: 0247
Ending address: 0FBE

When you've entered the data for *Calendar*, save two copies to a GEOS work disk. Save the first with the filename CALENDAR and the second with the name CALENDAR.BKUP. One copy will be converted by *GeoConverter* 2.0 into a GEOS desk accessory. The other is a backup copy in case you have a problem with the conversion.

Now type in *GeoConverter* 2.0. (This is the latest version of *GeoConverter*, presented here for the first time.) Be sure to use *The Automatic Proofreader*, also found elsewhere in this issue, to prevent typing mistakes when you enter the program. Save a copy of *GeoConverter* 2.0 to the disk that contains *Calendar*. Be very careful when typing in *GeoConverter* 2.0. It writes directly to your disk, and a typing error could cause it to scramble the disk.

To prepare *Calendar* for use with GEOS, load *GeoConverter* 2.0 and type RUN. When prompted for a filename, enter CALENDAR. *GeoConverter* 2.0 then converts the file into a GEOS desk accessory.

Using the Program

To use *Calendar*, either double-click on its icon or select calendar from the geos menu. The program displays a calendar of the current month in the center of your screen. From left to right along the top of the calendar window are a file menu, two arrow icons, the name of the current month, two more arrow icons, and the current year.

To change the month, click on one of the arrow icons to the left of the month name. The left-arrow icon displays the previous month; the right arrow displays the following month.

Change the year by clicking on one of the arrow icons just to the left of the current year. The left arrow changes the display to the same month in the previous year. The right arrow causes the same month in the following year to be shown.

Using the two sets of arrow icons, you can have *Calendar* display months in the distant past or in the future. There is no limit as to how far you can go either way.

To enter notes for any day of the month that's currently displayed, click in the box corresponding to that day. A dialog box opens on top of the calendar, and any notes that you've previously entered are shown. For each day, there's room for 7 one-line notes. To the left of each note, *Calendar* displays two icons, E and D. Click on the E icon to edit the corresponding note or to create a note if none exists. Enter up to 34 characters for each note, and press RETURN when you've finished. While you're editing a note, you may not close the dialog box or click on another icon. Clicking on the D icon deletes the corresponding note. Clicking on the close icon in the upper right corner of the dialog box saves the notes and returns you to the calendar. Dates which have notes will now be highlighted.

Calendar is designed to handle notes for as many as 75 days at a time. Therefore, you may need to delete old notes as they become obsolete. To simplify this process, use the purge option from the file menu. Purge removes all notes for days prior to the current system date. Be sure that the system date is set correctly before using this command.

When you're ready to leave *Calendar*, click on the file menu and select quit. The program saves your notes to disk in the file REMINDERS. Each time you run *Calendar*, it looks for this file. If it finds it, the program loads the notes. Otherwise, it assumes no notes exist and begins with an empty calendar. Deleting the REMINDERS file is a quick way to delete all the notes in the calendar. If you remove all of the notes within *Calendar*, the program automatically deletes the REMINDERS file.

Calendar

```
0247:5D 03 15 BF FF FF FF 80 D9
024F:00 01 BF FF FD A0 00 05 03
0257:AC 4E E5 AA A4 C5 AC A4 E6
025F:E5 A0 00 05 BF FF FD A4 6D
0267:92 45 A4 92 45 BF FF FD EA
026F:A4 92 45 A4 92 45 BF FF 86
0277:FD A4 92 45 A4 92 45 BF 04
027F:FF FD BF FF FD 80 00 01 ED
0287:FF FF FF 83 05 00 00 04 EF
028F:51 41 00 04 43 61 6C 65 AA
0297:6E 64 61 72 20 20 20 20 21
029F:56 31 2E 31 00 00 00 00 F3
02A7:52 69 63 68 61 72 64 20 DF
02AF:41 2E 20 52 61 72 64 69 10
02B7:6E 20 20 5D 2C 00 00 43 79
02BF:61 6C 65 6E 64 61 72 20 D0
02C7:61 63 63 65 73 73 6F 72 D2
02CF:79 20 66 6F 72 20 72 65 BA
02D7:63 6F 72 64 69 6E 67 20 F1
02DF:6E 6F 74 65 73 5D 3A 00 61
02E7:00 A5 16 8D 93 20 20 D3 22
02EF:0F 20 59 10 20 9B 0F A9 E6
02F7:C0 85 2F A9 00 8D B2 14 ED
02FF:AD 18 85 8D 7D 14 AD 17 19
0307:85 8D 82 14 8D 7E 14 AD 01
030F:16 85 8D 83 14 A9 00 8D 40
0317:84 14 20 E6 07 20 58 06 46
031F:20 6B 07 20 23 07 20 0D 75
0327:0A 20 D2 08 A9 05 85 03 84
032F:A9 3A 85 02 20 5A C1 A9 01
0337:04 85 03 A9 6B 85 02 A9 BA
033F:00 20 51 C1 A9 00 8D 79 75
0347:14 A9 0C 8D AA 84 A9 48 1F
034F:8D A9 84 60 18 24 28 00 BE
0357:3C 00 01 88 04 80 77 04 39
035F:24 41 28 00 5A 00 82 8D 32
0367:04 00 67 0B 93 04 00 72 2C
036F:05 66 69 6C 65 00 70 75 07
0377:72 67 65 00 71 75 69 74 E5
037F:00 53 75 6E 00 00 00 4D 3D
0387:6F 6E 00 00 00 54 75 65 82
038F:73 00 00 57 65 64 00 00 81
0397:00 54 68 75 72 73 00 46 BE
039F:72 69 00 00 00 53 61 74 BD
03A7:00 00 00 4A 61 6E 75 61 63
03AF:72 79 20 20 00 46 65 62 99
03B7:72 75 61 72 79 20 00 20 14
03BF:4D 61 72 63 68 20 20 20 6D
03C7:00 20 20 41 70 72 69 6C 7A
03CF:20 20 00 20 20 4D 61 79 62
03D7:20 20 20 20 00 20 20 4A 07
03DF:75 6E 65 20 20 20 00 20 8C
03E7:20 4A 75 6C 79 20 20 20 B2
03EF:00 20 41 75 67 75 73 74 E9
03F7:20 20 00 53 65 70 74 65 86
03FF:6D 62 65 72 00 20 4F 63 AB
0407:74 6F 62 65 72 20 00 4E 2A
```

```
040F:6F 76 65 6D 62 65 72 20 9D
0417:00 44 65 63 65 6D 62 65 1E
041F:72 20 00 04 00 00 00 5E 07
0427:05 0D 1B 01 08 84 05 68 2D
042F:05 0E 1B 01 08 DA 05 5E C4
0437:05 1B 1B 01 08 41 06 68 B5
043F:05 1C 1B 01 08 2A 06 89 C2
0447:FF EF CF 81 81 CF EF FF 88
044F:BF 89 FF F7 F3 81 81 F3 B5
0457:F7 FF BF 20 BD C1 20 2C B6
045F:0A 20 8E 10 20 16 10 20 E0
0467:B7 0F 4C 3E C2 20 91 05 3B
046F:20 F3 06 20 6B 07 20 D2 D1
0477:08 60 AE 82 14 CA CA 10 0B
047F:02 A2 0B BD DA 07 20 9B 3D
0487:08 AD 84 14 8D 87 14 AD 31
048F:83 14 8D 86 14 20 AE 08 FE
0497:D0 0C AD 82 14 C9 03 D0 87
049F:05 A9 01 20 9B 08 AE 82 93
04A7:14 CA D0 13 AD 83 14 38 93
04AF:E9 01 8D 83 14 AD 84 14 4B
04B7:E9 00 8D 84 14 A2 0C 8E 80
04BF:82 14 60 20 E7 05 20 F3 A3
04C7:06 20 6B 07 20 D2 08 60 75
04CF:AE 82 14 CA BD DA 07 20 86
04D7:8C 08 AD 84 14 8D 87 14 20
04DF:AD 83 14 8D 86 14 20 AE 6E
04E7:08 D0 0C AD 82 14 C9 02 7E
04EF:D0 05 A9 01 20 8C 08 AE D8
04F7:82 14 E8 E0 0D D0 10 18 55
04FF:A9 01 6D 83 14 8D 83 14 F4
0507:90 03 EE 84 14 A2 01 8E FB
050F:82 14 60 A9 0C 8D 7C 14 A9
0517:20 E7 05 CE 7C 14 D0 F8 87
051F:20 F3 06 20 6B 07 20 D2 83
0527:08 60 A9 0C 8D 7C 14 20 E9
052F:91 05 CE 7C 14 D0 F8 20 DA
0537:F3 06 20 6B 07 20 D2 08 DD
053F:60 A9 00 20 39 C1 A9 18 22
0547:85 06 A9 9E 85 07 A9 00 50
054F:85 09 A9 28 85 08 A9 01 B6
0557:85 0B A9 0F 85 0A 20 24 C5
055F:C1 A9 FF 20 27 C1 A5 06 48
0567:85 18 20 DC 06 A5 18 8D 90
056F:74 14 18 A9 0C 65 18 85 02
0577:18 A5 18 8D 8D 14 A9 FF E2
057F:20 18 C1 A9 04 8D 7B 14 D3
0587:18 A9 16 65 18 85 18 A9 D1
058F:FF 20 18 C1 CE 7B 14 D0 1E
0597:EF A5 09 85 0B A5 08 85 01
059F:0A AD 74 14 85 08 A5 07 88
05A7:85 09 A9 06 8D 7B 14 18 E6
05AF:A9 21 65 0A 85 0A 90 02 9B
05B7:E6 0B A9 FF 20 21 C1 CE 05
05BF:7B 14 D0 EB 60 A9 04 8D A4
05C7:7B 14 18 A9 03 65 18 85 95
05CF:18 A9 FF 20 18 C1 CE 7B 33
05D7:14 D0 EF 60 A9 00 20 39 EA
05DF:C1 AD 8D 14 85 06 A9 9E 5F
05E7:85 07 A9 00 85 09 A9 28 77
05EF:85 08 A9 01 85 0B A9 0F BE
05F7:85 0A 20 24 C1 A9 FF 20 62
05FF:27 C1 A5 06 85 18 8D 74 3F
0607:14 4C 9A 06 A9 2D 85 05 F5
060F:A9 07 8D 7B 14 A9 04 85 EF
0617:21 A9 98 85 20 A9 00 85 B6
061F:1F A9 2B 85 1E A5 21 85 32
0627:03 A5 20 85 02 A5 1F 85 E4
062F:19 A5 1E 85 18 20 48 C1 E0
0637:18 A9 21 65 1E 85 1E 90 08
063F:02 E6 1F 18 A9 06 65 20 BB
0647:85 20 90 02 E6 21 CE 7B 25
064F:14 D0 D2 60 20 9F C1 19 16
0657:23 80 00 B9 00 20 AB 07 8F
065F:A9 21 85 05 A9 00 85 19 FA
0667:A9 87 85 18 20 48 C1 20 22
066F:9F C1 19 23 EF 00 07 01 9F
0677:A9 21 85 05 A9 00 85 19 13
067F:A9 F1 85 18 AD 84 14 85 3C
0687:03 AD 83 14 85 02 A9 C0 7A
068F:20 84 C1 60 AE 82 14 CA 7D
0697:86 02 A9 00 85 03 A9 00 28
069F:85 15 A9 0A 85 14 A2 02 4D
06A7:A0 14 20 66 C1 A9 04 85 B5
06AF:15 A9 C2 85 14 A5 14 18 D8
06B7:65 02 85 02 A5 15 65 03 17
06BF:85 03 60 03 00 03 02 03 9E
06C7:02 03 03 02 03 02 03 AD E9
06CF:83 14 C9 50 B0 14 18 A9 90
06D7:D0 6D 83 14 8D 83 14 A9 A5
06DF:07 6D 84 14 8D 84 14 B8 FB
06E7:50 11 18 A9 6C 6D 83 14 32
06EF:8D 83 14 A9 07 6D 84 14 CB
06F7:8D 84 14 AD 84 14 8D 80 59
06FF:14 AD 83 14 8D 7F 14 A9 6F
0707:03 8D 88 14 A9 01 8D 85 3E
070F:14 A9 07 8D 87 14 A9 BC E7
0717:8D 86 14 AD 87 14 CD 84 97
071F:14 D0 06 AD 86 14 CD 83 AA
0727:14 F0 20 20 AE 08 D0 05 BD
072F:A9 01 20 8C 08 A9 01 20 28
0737:8C 08 18 A9 01 6D 86 14 0A
073F:8D 86 14 90 03 EE 87 14 38
0747:B8 50 D0 AD 85 14 CD 82 55
074F:14 F0 21 20 AE 08 D0 0C 0D
0757:AD 85 14 C9 02 D0 05 A9 C3
075F:01 20 8C 08 AE 85 14 CA 86
0767:BD DA 07 20 8C 08 EE 85 D5
076F:14 B8 50 D7 60 18 6D 88 04
0777:14 C9 08 30 03 38 E9 07 D9
077F:8D 88 14 60 85 20 AD 88 8F
0787:14 38 E5 20 F0 02 10 03 1F
078F:18 69 07 8D 88 14 60 AD C0
0797:87 14 85 03 AD 86 14 85 84
079F:02 A9 00 85 05 A9 04 85 CD
07A7:04 A2 02 A0 04 20 69 C1 DF
07AF:A5 13 C9 00 D0 04 A5 12 82
07B7:C9 00 60 AD 84 14 8D 87 A8
07BF:14 AD 83 14 8D 86 14 AE 52
07C7:82 14 CA A9 1C 18 7D DA 27
07CF:07 8D 8C 14 20 AE 08 D0 34
07D7:0A AD 82 14 C9 02 D0 03 E2
07DF:EE 8C 14 A9 00 8D 8B 14 07
07E7:AE 88 14 CA 8E 8A 14 A9 0F
07EF:01 8D 7B 14 A9 00 8D 78 73
07F7:14 20 F0 09 AD 8B 14 C9 54
07FF:05 D0 06 20 97 09 B8 50 2A
0807:4C A9 00 85 19 A9 21 85 37
080F:18 AD 8A 14 85 04 A9 00 B8
0817:85 05 A2 18 A0 04 20 66 BC
081F:C1 18 A9 2C 65 18 85 18 BC
0827:90 02 E6 19 A9 16 85 04 23
082F:AD 8B 14 85 06 A2 04 A0 37
0837:06 20 60 C1 A5 04 18 69 51
083F:38 85 04 A5 04 85 05 AD 95
0847:7B 14 85 02 A9 00 85 03 46
084F:A9 C0 20 84 C1 A9 20 20 C5
0857:45 C1 A9 1B 20 45 C1 AE A9
085F:8A 14 E8 E0 07 D0 05 EE 59
0867:8B 14 A2 00 8E 8A 14 EE 4C
086F:7B 14 AD 7B 14 CD 8C 14 B4
0877:F0 02 10 03 4C 10 09 60 C7
087F:A9 93 85 18 A9 00 85 09 DC
0887:A9 28 85 08 A9 9B 85 05 73
088F:EE 78 14 AD 78 14 C9 02 3C
0897:F0 13 A9 00 85 0B A9 49 0F
089F:85 0A A9 00 85 21 A9 3B 69
08A7:85 20 B8 50 10 A9 00 85 4B
08AF:0B A9 6A 85 0A A9 00 85 D1
08B7:21 A9 5C 85 20 A9 FF 20 6E
08BF:18 C1 A5 21 85 19 A5 20 0F
08C7:85 18 AD 7B 14 85 02 A9 72
08CF:00 85 03 A9 C0 20 84 C1 8D
08D7:60 AD 7B 14 8D 81 14 20 EE
08DF:A7 0A E0 00 D0 05 A9 12 62
08E7:20 45 C1 60 52 65 6D 69 04
08EF:6E 64 65 72 73 00 A9 0A 1D
08F7:85 0F A9 03 85 0E A9 00 AB
08FF:85 02 20 08 C2 E0 00 F0 62
0907:0B A9 14 85 1D A9 B3 85 60
090F:1C 20 09 0C 60 A9 0A 85 5C
0917:03 A9 03 85 02 20 38 C2 91
091F:AD B2 14 D0 01 60 85 02 DA
0927:A9 00 85 03 A9 00 85 05 4C
092F:A9 28 85 04 A2 02 A0 04 73
0937:20 66 C1 A9 B3 18 65 02 90
093F:85 02 A9 14 65 03 85 03 50
0947:18 A9 04 65 02 85 02 90 61
094F:02 E6 03 A9 0A 8D 01 81 21
0957:A9 03 8D 00 81 A9 14 8D 19
095F:48 81 A9 B2 8D 47 81 A5 88
0967:03 8D 4A 81 A5 02 8D 49 59
096F:81 A9 07 8D 45 81 A9 00 E9
0977:8D 75 81 A9 00 8D A0 81 71
097F:A9 81 85 15 A9 00 85 14 35
0987:A9 01 85 16 20 ED C1 60 5D
098F:A9 14 85 1D A9 B3 85 1C 41
0997:A2 00 20 43 0C F0 13 20 9D
099F:13 0C F0 11 18 A9 28 65 8A
09A7:1C 85 1C 90 02 E6 1D B8 54
09AF:50 E8 A2 01 60 A5 1D 85 E1
09B7:03 A5 1C 85 02 18 A9 04 58
09BF:65 02 85 02 90 02 E6 03 33
09C7:A2 00 60 A9 00 8D 75 14 07
09CF:A9 14 85 03 A9 8F 85 02 35
09D7:A0 00 B1 02 F0 5E AD B2 9F
09DF:14 C9 4B F0 5A EE B2 14 EE
09E7:A9 14 85 1D A9 B3 85 1C 99
09EF:20 43 0C F0 0E 18 A9 28 BF
09F7:65 1C 85 1C 90 02 E6 1D AD
09FF:B8 50 ED A0 00 AD 83 14 1C
0A07:91 1C C8 AD 84 14 91 1C 92
0A0F:C8 AD 82 14 91 1C C8 AD C0
0A17:81 14 91 1C 18 A9 04 65 B9
0A1F:1C 85 1C 90 02 E6 1D A2 B7
0A27:02 A0 1C 20 65 C2 18 A9 F9
0A2F:24 65 1C 85 1C 90 02 E6 98
0A37:1D 20 09 0C A2 00 60 A2 3C
0A3F:01 60 20 A7 0A E0 00 F0 2F
0A47:01 60 20 D2 0B A2 00 60 68
0A4F:20 BD C1 A9 14 85 1D A9 50
0A57:B3 85 1C AD 82 14 8D 85 0A
0A5F:14 AD 83 14 8D 86 14 AD F6
0A67:82 14 8D 85 14 AD 80 14 38
0A6F:8D 84 14 AD 7F 14 8D 83 B3
0A77:14 AD 7E 14 8D 82 14 AD 5E
0A7F:7D 14 8D 81 14 20 43 0C D4
0A87:F0 1B 20 13 0C F0 08 10 54
0A8F:06 20 D2 0B B8 50 EE 18 B6
0A97:A9 28 65 1C 85 1C 90 02 B8
0A9F:E6 1D B8 50 E0 AD 87 14 6B
0AA7:8D 84 14 AD 86 14 8D 83 24
0AAF:14 AD 85 14 8D 82 14 20 E9
0AB7:D2 08 60 A5 1D 85 03 A5 48
0ABF:1C 85 02 18 A9 28 65 02 BF
0AC7:85 02 90 02 E6 03 A5 1D FC
0ACF:85 05 A5 1C 85 04 A9 20 0E
0AD7:85 07 A9 93 85 06 A5 06 74
0ADF:38 E5 02 85 06 A5 07 E5 DC
0AE7:03 85 07 20 7E C1 CE B2 0D
0AEF:14 60 A9 00 A0 03 91 1C AB
0AF7:88 10 FB 60 A0 00 B1 1C 5E
0AFF:CD 83 14 D0 19 C8 B1 1C D6
0B07:CD 84 14 D0 11 C8 B1 1C DF
0B0F:CD 82 14 D0 09 C8 20 36 1E
0B17:0C 31 1C CD 81 14 60 AD AA
0B1F:81 14 29 E0 F0 03 A9 FF 15
0B27:60 A9 1F 60 A0 02 B1 1C 4E
0B2F:60 AD 05 85 10 01 60 A5 C4
0B37:3B 85 03 A5 3A 85 02 A5 98
0B3F:02 38 E9 28 85 02 A5 03 A6
0B47:E9 00 85 03 30 27 A9 00 A4
0B4F:85 05 A9 21 85 04 A2 02 34
0B57:A0 04 20 69 C1 A5 02 C9 CB
0B5F:07 10 27 A5 3C 85 04 A9 E5
0B67:00 85 05 38 A5 04 ED 8D A9
0B6F:14 85 04 C6 04 30 68 A9 39
0B77:00 85 07 A9 16 85 06 A2 DF
0B7F:04 A0 06 20 69 C1 A5 04 24
0B87:C9 05 10 53 A5 02 8D 89 D4
0B8F:14 E6 02 A9 07 85 06 A2 41
0B97:04 A0 06 20 60 C1 18 A5 7A
0B9F:04 65 02 85 02 A5 02 8D E1
0BA7:8E 14 38 A5 02 ED 88 14 58
0BAF:85 02 E6 02 A5 02 8D 81 D7
0BB7:14 30 24 F0 22 AD 8C 14 6C
0BBF:C5 02 90 1B AD 78 14 F0 65
0BC7:03 20 8D 0D A9 00 8D 75 C7
0BCF:14 A9 0C 85 03 A9 F7 85 68
0BD7:02 20 56 C2 20 D2 08 60 AA
0BDF:00 27 8D 28 00 0F 01 13 45
0BE7:75 0E 00 08 F5 00 2D 46 0D
0BEF:0D 06 37 03 0A B4 0D 46 A8
0BF7:0D 06 43 03 0A B4 0D 46 32
0BFF:0D 06 4F 03 0A B4 0D 46 BB
```

```
0C07:0D 06 5B 03 0A B4 0D 46 46
0C0F:0D 06 67 03 0A B4 0D 46 CF
0C17:0D 06 73 03 0A B4 0D 46 59
0C1F:0D 06 7F 03 0A B4 0D 69 06
0C27:0D 1E 28 02 0B 84 0D 9E 95
0C2F:FF FF FF 80 10 01 80 10 E4
0C37:19 8F 10 19 99 90 F9 9F F5
0C3F:91 99 98 11 99 8F 10 F9 CF
0C47:80 10 01 FF FF FF 12 00 E7
0C4F:06 BF 96 FF FF 80 01 80 B1
0C57:01 80 01 87 E1 87 E1 87 21
0C5F:E1 80 01 80 01 80 01 FF BC
0C67:FF 0A 00 04 BF AD 75 14 F5
0C6F:D0 03 4C BF C2 60 AD 8E B7
0C77:14 C9 1D F0 0D C9 1E F0 7B
0C7F:01 60 AD 78 14 C9 02 F0 2A
0C87:01 60 A5 3C C9 93 F0 03 32
0C8F:10 01 60 18 A9 07 6D 81 43
0C97:14 8D 81 14 60 AD 75 14 47
0C9F:F0 01 60 A9 27 85 06 A9 1C
0CA7:8D 85 07 A9 00 85 09 A9 35
0CAF:30 85 08 A9 00 85 0B A9 B2
0CB7:3B 85 0A 20 B3 C2 30 06 21
0CBF:20 E1 0D B8 50 03 20 0C 68
0CC7:0E 60 20 5E 0E 20 59 0B 97
0CCF:20 D3 0E A5 05 85 06 18 6B
0CD7:69 08 85 07 A5 19 85 09 6D
0CDF:A5 18 85 08 A9 01 85 0B 69
0CE7:A9 0E 85 0A A9 00 20 39 70
0CEF:C1 20 24 C1 60 A9 01 8D CA
0CF7:75 14 20 5E 0E 20 A7 0A 04
0CFF:E0 00 D0 15 A9 14 85 1D B9
0D07:A9 8F 85 1C A2 02 A0 1C C6
0D0F:20 65 C2 20 59 0B B8 50 A5
0D17:05 A9 00 8D 8F 14 A9 14 2B
0D1F:85 1D A9 8F 85 1C 20 D3 22
0D27:0E A9 00 85 04 A9 22 85 9B
0D2F:06 A9 14 85 03 A9 8F 85 F4
0D37:02 A9 0A 8D A4 84 A9 E2 44
0D3F:8D A3 84 20 BA C1 60 E6 20
0D47:02 A5 02 8D 7B 14 20 F9 4B
0D4F:0E 85 20 AD 81 14 29 1F 7E
0D57:05 20 8D 81 14 60 A9 00 3B
0D5F:85 09 A9 28 85 08 A9 01 D6
0D67:85 0B A9 0F 85 0A A9 27 FB
0D6F:85 18 20 DC 06 20 00 0F E3
0D77:A9 00 8D 7B 14 AD 7B 14 32
0D7F:85 02 20 5E 0E 20 A7 0A 11
0D87:E0 00 D0 1D A5 03 85 1D 5F
0D8F:A5 02 85 1C 20 D3 0E 18 F3
0D97:A9 06 65 05 85 05 A5 1D AD
0D9F:85 03 A5 1C 85 02 20 48 70
0DA7:C1 AD 7B 14 C9 07 D0 CD 98
0DAF:A9 0D 85 03 A9 02 85 02 25
0DB7:20 5A C1 60 AD 7B 14 85 BF
0DBF:02 C6 02 A9 0C 85 04 A2 88
0DC7:02 A0 04 20 60 C1 18 A9 71
0DCF:39 65 02 85 02 A5 02 85 A8
0DD7:05 A9 00 85 19 A9 4C 85 C4
0DDF:18 60 A2 05 0A CA D0 FC DC
0DE7:60 A9 30 85 05 A9 00 85 4F
0DEF:19 A9 32 85 18 A9 20 20 67
0DF7:45 C1 AD 89 14 85 02 A9 D7
0DFF:00 85 03 A9 00 85 07 A9 44
0E07:06 85 06 A2 02 A0 06 20 31
0E0F:66 C1 A9 04 85 07 A9 98 78
0E17:85 06 A5 06 18 65 02 85 6C
0E1F:02 A5 07 65 03 85 03 20 31
0E27:48 C1 A9 2C 20 45 C1 A9 13
0E2F:20 20 45 C1 20 AB 07 20 06
0E37:85 0F A9 20 20 45 C1 AD 58
0E3F:81 14 29 1F 85 02 A9 00 BF
0E47:85 03 A9 FF 20 84 C1 A9 5C
0E4F:2C 20 45 C1 A9 20 20 45 A1
0E57:C1 AD 84 14 85 03 AD 83 A8
0E5F:14 85 02 A9 FF 20 84 C1 0D
0E67:A9 20 20 45 C1 60 A0 00 89
0E6F:B1 02 F0 0F C9 20 F0 07 AB
0E77:84 20 20 45 C1 A4 20 C8 DF
0E7F:B8 50 ED 60 A9 85 85 03 41
0E87:A9 1F 85 02 A9 10 85 05 AE
0E8F:A9 D6 85 04 A9 03 85 07 92
0E97:A9 9E 85 06 20 7E C1 60 20
0E9F:A9 10 85 03 A9 D6 85 02 2B
0EA7:A9 85 85 05 A9 1F 85 04 D3
0EAF:A9 03 85 07 A9 9E 85 06 5B
0EB7:20 7E C1 60 A9 20 85 03 9D
0EBF:A9 94 85 02 A2 18 20 3C 98
0EC7:C1 18 A9 28 65 0C 85 0C F4
0ECF:90 02 E6 0D 18 A9 28 65 7F
0ED7:0E 85 0E 90 02 E6 0F A0 91
0EDF:E7 B1 0E 20 BE 10 2C 93 42
0EE7:20 10 05 B1 0C 20 BE 10 42
0EEF:88 C0 FF D0 EC 8A 18 69 B8
0EF7:08 AA E0 A0 90 C8 60 A9 FA
0EFF:20 85 03 A9 94 85 02 A2 E9
0F07:18 20 3C C1 18 A9 28 65 F9
0F0F:0C 85 0C 90 02 E6 0D 18 FC
0F17:A9 28 65 0E 85 0E 90 02 29
0F1F:E6 0F A0 E7 20 C7 10 91 D8
0F27:0E 2C 93 20 10 05 20 C7 68
0F2F:10 91 0C 88 C0 FF D0 EC 58
0F37:8A 18 69 08 AA E0 A0 90 F8
0F3F:C8 60 A9 3F 85 03 A9 64 F2
0F47:85 02 A9 8C 85 07 A9 7D BF
0F4F:85 06 A2 11 A0 1C 2C 93 78
0F57:20 50 05 B1 06 20 BE 10 93
0F5F:AD 27 8C 91 06 88 10 EE 2A
0F67:18 A9 28 65 06 85 06 90 3A
0F6F:02 E6 07 CA D0 DE 60 2C C4
0F77:93 20 50 2A A9 3F 85 03 6C
0F7F:A9 64 85 02 A9 8C 85 07 ED
0F87:A9 7D 85 06 A2 11 A0 1C A1
0F8F:20 C7 10 91 06 88 10 F8 36
0F97:18 A9 28 65 06 85 06 90 6A
0F9F:02 E6 07 CA D0 E8 60 84 75
0FA7:04 A0 00 91 02 B8 50 06 A2
0FAF:84 04 A0 00 B1 02 E6 02 8A
0FB7:D0 02 E6 03 A4 04 60 00 C1
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In *COMPUTE!'s Gazette* Programs," elsewhere in this issue.

GeoConverter 2.0

```
HQ 10 REM COPYRIGHT 1990 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
SE 20 IF(PEEK(772)+PEEK(773)*2
      56)=42364THEN40
QK 30 COLOR0,1:COLOR4,1:COLOR6
      ,1:SA=PEEK(4625)*256+PEE
      K(4624):GOTO50
SX 40 POKE56,PEEK(46)+40:CLR:P
      OKE53280,0:POKE53281,0:S
      A=PEEK(56)*256+PEEK(55)
RP 50 PRINT"{CLR}{8}{N}{DOWN}"
      TAB(12)"{RVS}GEOCONVERTE
      R 2.0{OFF}{GRN}{3 DOWN}"
      :PRINTTAB(13)"COPYRIGHT
      {SPACE}1990{DOWN}"
KR 60 PRINTTAB(7)"COMPUTE! PUB
      LICATIONS INC.{DOWN}":PR
      INTTAB(11)"ALL RIGHTS RE
      SERVED{2 DOWN}"
MK 70 N=8:PRINT"DRIVE NUMBER "
      N"{4 LEFT}";:INPUTN:IFN<
      8ORN>11THEN70
QE 80 K$="N":PRINT"IS DRIVE"N"
      A 1581? "K$"{3 LEFT}";:I
      NPUTK$:IFK$<>"N"ANDK$<>"
      Y"THEN80
SB 90 T$=CHR$(18):S$=CHR$(1):I
      FK$="Y"THENT$=CHR$(40):S
      $=CHR$(3)
RS 100 INPUT"FILE TO CONVERT";
       NM$:OPEN15,N,15:OPEN1,N
       ,8,"0:"+NM$+",P,R"
BX 110 GOSUB440:IFEN<>0THENPRI
       NT"{RVS}"EN$" "EM$ET$EE
       $:GOTO400
FF 120 GET#1,K$,V$:IFK$<>CHR$(
       71)ORV$<>CHR$(2)THENCLO
       SE1:CLOSE15:GOTO220
BR 130 PRINT"{DOWN}DECOMPRESSI
       NG...":Z$=CHR$(0):GET#1
       ,ESC$:ESC=ASC(ESC$+Z$):
       AD=SA
RQ 140 GOSUB170:IFV<>ESCTHENPO
       KEAD,V:AD=AD+1:GOTO140
PP 150 GOSUB170:CT=V:GOSUB170:
       CT=CT+V*256:GOSUB170:GO
       SUB160:GOTO140
DH 160 FORI=1TOCT:POKEAD,V:AD=
       AD+1:NEXTI:CT=0:RETURN
PK 170 GET#1,V$:S=ST:V=ASC(V$+
       Z$):IFST=0THENRETURN
SJ 180 IFS<>64THENGOSUB440:PRI
       NT"{DOWN}LOAD ERROR -
       {RVS}"EN$" "EM$ET$EE$:G
       OTO400
AF 190 IFCT<>0THENGOSUB160:AD=
       AD-1
DG 200 PRINT"{DOWN}WRITING..."
       :CLOSE1:PRINT#15,"S0:"+
       NM$:CLOSE15
EF 210 OPEN1,N,8,"0:"+NM$+",P,
       W":FORI=SATOAD:PRINT#1,
       CHR$(PEEK(I));:NEXTI:CL
       OSE1
GP 220 PRINT"{DOWN}CONVERTING.
       ..":HD$="":FORI=1TO4:RE
       ADHE:HD$=HD$+CHR$(HE):N
       EXTI
CF 230 FORI=1TO5:READIE:ID$=ID
       $+CHR$(IE):NEXTI
DR 240 NL$="":OPEN15,N,15,"I0:
       ":OPEN2,N,2,"#"
MM 250 GOSUB410:GET #2,NT$,NS$
       :FORE=0TO7:D$=NL$:GET#2
       ,B$:I=1:IFB$=NL$THEN310
PE 260 IF ASC(B$)<>130 THEN310
AE 270 GET#2,HT$,HS$:I=3:IFHS$
       =""THENHS$=CHR$(0)
DJ 280 GET#2,B$:I=I+1:IFB$=""T
       HENB$=CHR$(0)
BM 290 IF(ASC(B$)=160)OR(I=19)
       THEN310
SF 300 D$=D$+B$:GOTO280
EB 310 FORI=1TO31:GET#2,B$:NEX
       TI:IFD$=NM$THEN340
JX 320 NEXTE:IFNT$=NL$THEN340
CH 330 T$=NT$:S$=NS$:GOTO250
GA 340 IFD$=NL$THENPRINT"
       {DOWN}DISK ERROR!":GOTO
       400
PD 350 DT$=T$:SS$=S$:T$=HT$:S$
       =HS$:GOSUB410:GET#2,MT$
       ,MS$:IFMS$=""THENMS$=CH
       R$(0)
GF 360 FORI=0TO65:GET#2,B$:NEX
       TI:GET#2,CT$,GT$:GOSUB4
       10:PRINT#2,HD$;:GOSUB42
       0
RX 370 T$=DT$:S$=SS$:GOSUB410:
       FORI=1TO32*E+2:GET#2,B$
       :NEXTI:PRINT#2,CT$;MT$;
       MS$;
MB 380 FORI=0TO15:GET#2,B$:NEX
       TI:PRINT#2,HT$;HS$;CHR$
       (0);GT$;ID$;:GOSUB420
GR 390 PRINTNM$" CONVERTED!"
HB 400 CLOSE1:CLOSE2:CLOSE15:E
       ND
DQ 410 U$="U1":GOTO430
CS 420 U$="U2"
PA 430 PRINT#15,U$;2;0;ASC(T$+
       "0");ASC(S$+"0"):RETURN
JJ 440 INPUT#15,EN,EM$,ET,EE:E
       N$=STR$(EN):ET$=STR$(ET
       ):EE$=STR$(EE):RETURN
EH 450 DATA 0,255,3,21,87,10,1
       ,0,0
```

G

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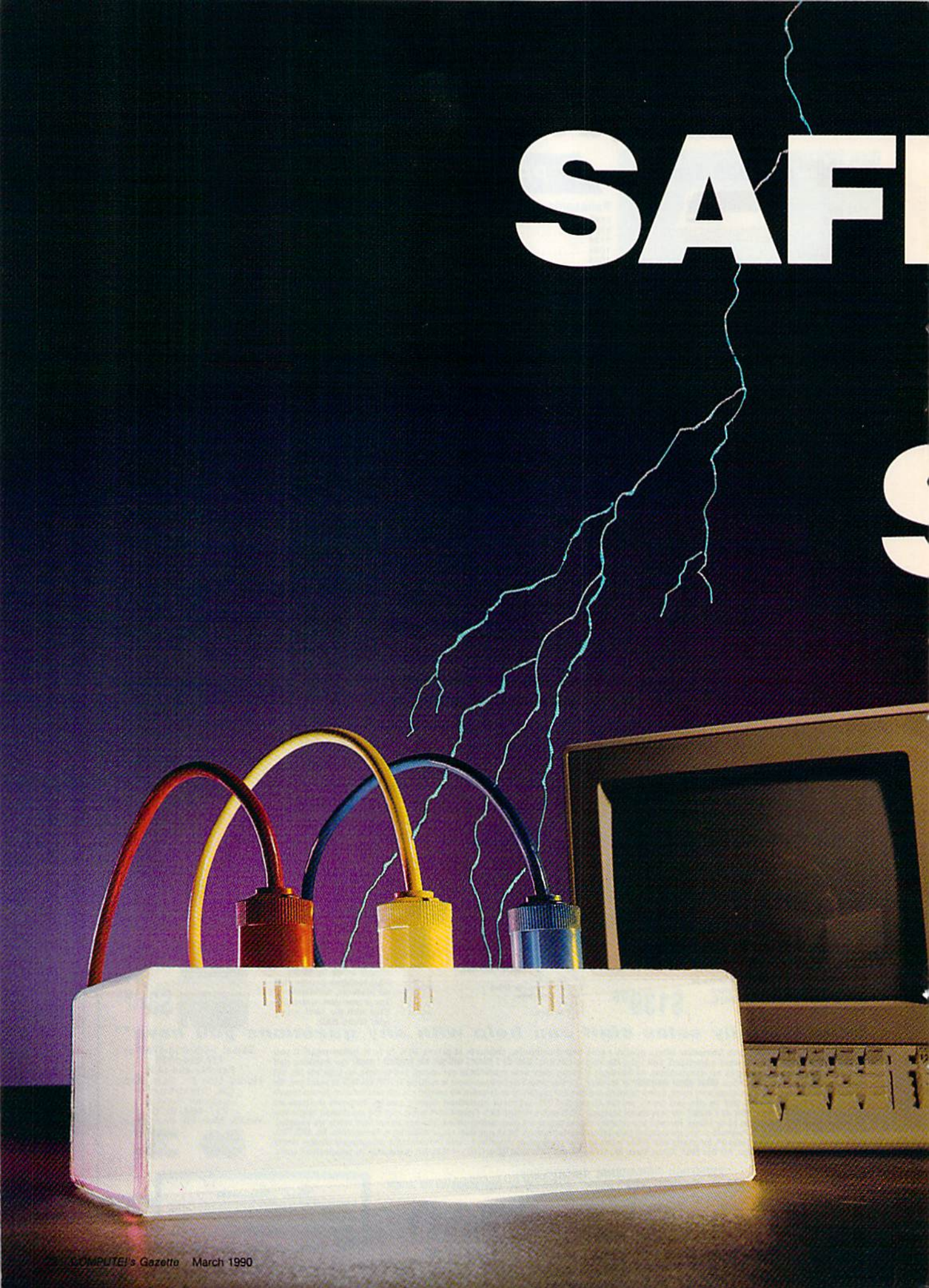
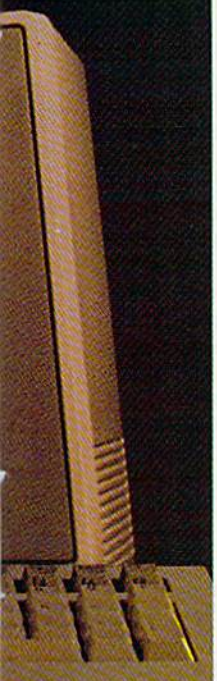


EGUARD YOUR SYSTEM!

How to Guard Against Bad Power



Sags, surges, spikes, and lightning can cost all computer owners precious time and a lot of money. What can you do to protect your system? Here's firsthand advice from an expert.

All computers have one thing in common: They hate bad power. *Bad power* is a term used to describe electric power that has the capability of damaging your computer severely (expensively) or causing your computer to lose some or all of your data. Most of us never really think about the quality of the power we use every day—but we should. Bad power can cause expensive damage to our computers and any other electronic devices in our home—VCRs, televisions, stereos, almost anything that uses digital electronics. ▷

Charles Kuhlmann

SAFEGUARD YOUR SYSTEM!

Sags, Surges, and Spikes

How does power get bad? We can't blame the power company; the quality of what it produces is excellent. It's what happens to the power after it travels for miles and miles that causes a degradation in quality. In simple terms, every device that uses electrical power injects its own amount of interference back into the power line. Some devices contribute negligible amounts that dissipate quickly, while others, like air conditioners, can cause the power-line voltage to drop (a *sag*) or increase (a *spike* or *surge*) for a short time. There are other power-line problems, too, but these are the most common.

A sag occurs when the line voltage drops from its normal value for a very short time, ranging from thousandths of a second to a few seconds. It's generally caused by heavy loads connected to the power line. The startup of a large electric motor is a good example of what causes a sag. When a sag occurs, the effect on your computer is the same as turning it off and on. In other words, everything not saved is history.

A surge happens when the power rises, sometimes up to 20 percent higher than normal, and, like a sag, lasts from thousandths of a second to a few seconds. A surge is usually caused by heavy loads (again, electric motors) being disconnected from the power line. The effect on your computer? It usually locks up or the surge causes damage to the computer's internal components.

A spike is a particularly nasty beast. It is a very short but very high increase in line voltage, sometimes as high as 600–1000 volts, that usually lasts for a few millionths of a second. It can cause computers to lock up, disk drives to clobber files, and microchips to be physically damaged, sometimes dramatically.

A spike can be caused by a variety of things, but the usual culprit is an electric motor. Spikes of 200 volts or less are the most common and require expensive supression devices. Spikes can be detected only by line-disturbance analyzers, which are quite expensive. They cost from $600 to $12,000—and you can't get them at Radio Shack. The electric company can't help to protect your equipment—its commitment, obviously, is not to producing computer-grade power. What it controls is the amount of power supplied and its frequency (60 Hz).

Play It Safe!

- ☐ Save your work often and maintain backup files.
- ☐ If possible, run a dedicated line from your breaker box to your computer.
- ☐ Use a spike or surge suppressor.
- ☐ Unplug your computer before a thunderstorm hits.

Causes and Solutions

Electric motors are the main cause of power-line problems. If you want to see how much garbage (technical term for "junk" or "stuff") an electric motor will generate, turn on your television and then run a hair dryer on the same circuit. All that "snow" (garbage) that you see on the screen is being created by the tiny motor in the dryer. Not only is this garbage being injected into your household power, but it is also being picked up by the antenna. You may wonder, with this kind of everyday interference, why your lights aren't constantly blinking on and off. Let's look at power from a computer's point of view.

Power-line problems usually occur in thousandths of a second (milliseconds) or millionths of a second (microseconds). And this is the same rate our computers execute program instructions. A computer relies on an internal clock, which is a steady stream of electrical signals that keeps everything in step. In the Commodore 64, these signals occur every one-millionth (1/1,000,000) of a second. If even one of those pulses is missing, or if a false one is generated due to a power-line disturbance, the computer will come to a screeching halt. Incandescent light bulbs are incapable of turning on and off that fast. Fluorescent lights can, but we couldn't see such an effect anyway.

What can you do to protect your computer system? A good way to reduce the amount of garbage fed from your wall socket to your computer is to have a separate, or dedicated, line run from your breaker box to your computer. (Don't attempt to install one yourself unless you're a qualified electrician.) There are also a number of devices called *surge supressors,* which are commonly found in many retail stores. For about $5, they offer a minimal amount of protection against surges and no real protection against spikes of 500 volts or less. Most spike protectors in stores don't start supressing until spikes are above 500 volts. The specifications of each device are usually on the product label in very small print. Read the labels carefully. There are some effective spike/surge suppressors in the $35–$75 range that do an acceptable job for the average user. These can be ordered through companies that deal in power-conditioning devices. Let your fingers do the walking.

The only protection against sags is a full-line conditioner or battery backup, but this product is beyond most of our financial capabilities.

Thunderstorms

The best way to protect your equipment during a thunderstorm is to shut it off and wait out the storm. For the ultimate in protection, unplug the computer, as well as any other appliances you value. It's amazing how many people will work through a severe thunderstorm, thinking that the worst that can happen is a blackout. They forget that lightning has a talent for disturbing power lines for miles around when it hits hard.

The moments just before the lights go out are the most dangerous. Why? The electric company automatically tries to compensate for line-voltage fluctuations whenever they occur. During a storm, then, the line voltage can rise and fall faster than a department store elevator at Christmas, not to mention the spikes and other goodies that are created. This kind of activity beats the daylights out of your equipment. So remember, if you hear thunder, shut off your equipment.

There aren't any easy solutions to the power problem, but using good common sense will make the difference between getting work done on your computer and waiting for your number to be called at the repair shop. **G**

Charles Kuhlmann is a customer engineer for Wang Laboratories in St. Louis, Missouri, with eight years' experience in diagnosing and correcting computer power problems.

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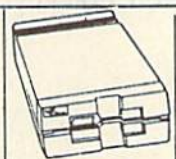

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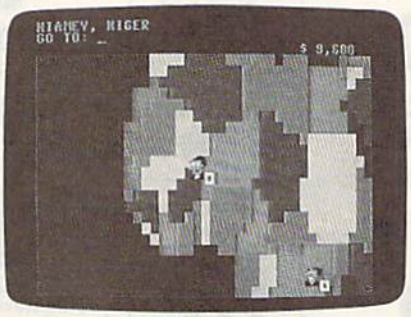
INTERNATIONAL BOUNTY HUNTER

EDITOR'S CHOICE

Neil Harvey

OK. You've played the original *Bounty Hunter* (August 1987), and now you're a whiz at U.S. geography. You're so good, in fact, that governments from all over the world are seeking your assistance to bring to justice the most dangerous criminals alive. But before you go international, you'd better brush up on your world geography.



From Niger to Rwanda, the chase continues.

International Bounty Hunter is played on a scrolling world map. You must move from country to country, using visual clues to determine the location of the criminal. Once you've caught him, you have a limited time to bring him back to the country that hired you. Along the way, you must identify every country or capital you pass through. If you fail to return the criminal in the alloted time, he escapes and you have to start the chase all over again.

Use your knowledge of world geography to round up the bad guys in this exciting educational game for the 128. Joystick required.

Typing It In

International Bounty Hunter consists of three programs. The main program, IBH, is written entirely in BASIC. Type it in using *The Automatic Proofreader*, found elsewhere in this issue. When you've finished, be sure to save a copy of the program to disk.

The second program, IBH Map Base, is a machine language file that contains the compressed color data for the maps. Type it in using *128 MLX*, the machine language entry program also found elsewhere in this issue. The *128 MLX* prompts, and the values you should enter, are as follows:

Starting address: C350
Ending address: D487

When you've finished typing, save this file to disk using the filename IBH MAP BASE.

The last program, IBH Map Expand, is a short BASIC program that decompresses IBH Map Base. Type it in using *The Automatic Proofreader*. When you've finished, be sure to save the program to disk.

Before you can play, you must decompress the file IBH MAP BASE. To do this, load and run IBH Map Expand. This program uncrunches IBH MAP BASE and saves the resulting file to disk as IBH MAP DATA.

When you're ready to play, plug a joystick into port 2. Then load and run IBH. After the program has loaded the map data, you'll be prompted for the type of game you wish to play. You have two choices. Game 1 requires you to identify the countries that you wish to travel to, and Game 2 requires you to identify their capitals.

After selecting the game type, you'll be prompted for the difficulty level (1–6). Level 1 is the easiest, while level 6 is the hardest. The difficulty level determines how often the criminal moves from place to place, as well as how much time you have to return a captured criminal to your employer.

World Navigating

When the game begins, you're automatically placed in the country that has hired you. Be sure to remember this country because it's where you must return the captured criminal. The white square beside your character represents the capital of the country that you're in. If you're in an extremely small country, the square is placed on a corner of the country.

The top screen line displays your current location, such as Washington, D.C., U.S.A. At the upper right, you'll find the bounty for the criminal that you're chasing. On the second screen line, you're prompted for a move.

You can move to any country adjacent to the one you're occupying or to one that is connected by a sea route. To move, type in the name of the country (in Game 1) or its capital (in Game 2) and press RETURN. If your response is invalid, the prompt will reappear. Otherwise, your character will be placed in the country you've selected.

As you move to different countries, the map display will scroll along with your character. Thus, your movement is not restricted to the area you see at the start of a game.

The Manhunt

Being an international bounty hunter is no easy task. You have to know where you are, where you're going, and where you've been, as well as be able to track down the bad guys. However, you're given a couple of tools to make your job easier.

The first tool at your disposal is a bad-guy detector, which appears as an asterisk in one corner of the screen. The placement of this asterisk tells you the general direction in which you must travel to reach the criminal. If you travel toward the asterisk, you'll eventually encounter the criminal. As you near him, you'll see him on the current screen. To capture him, you must occupy the country that he's in. Once you've captured the criminal, the asterisk will appear in the small white box beside your character.

In addition to your bad-guy detector, you're equipped with a panoramic viewfinder. This little device comes in handy if you need to get your bearings or to plot a shorter route to your destination. To use it, press F1. The word *LOOK* is displayed at the center of the screen. In LOOK mode, you can scroll the display around with the joystick. Neither your character nor the criminal will appear on the map while in this mode, so you can't use this as a shortcut for finding the criminal. When you've finished using the viewfinder, press the fire button to resume the game.

The moment you capture the fugitive, a timer is displayed to the left of the bounty. This timer counts from 0 to the limit determined by the skill level. If you make it back to your employer within the time limit, your job is complete and you're awarded the bounty. If you don't make it, the criminal escapes to a randomly selected country and you must start all over again. You'll soon learn that it pays to make haste.

Helpful Hints

If you find yourself stuck in a country and don't know the way out, don't panic. Just type *HELP* at the prompt or press the HELP key and you'll be given the name of a place to move to. This option randomly selects a country adjacent to the one you occupy. Consequently, you may have to use it several times before the name you're looking for appears. You can use the help option as often as you like, but keep in mind that in the meantime the criminal may flee.

The various skill levels that are offered allow you to fine-tune the game according to your ability. At level 1, you have six minutes to return the captured criminal to your employer. At level 2, you have five minutes; at level 3, four minutes; and so on.

The skill level that you choose also determines how quickly the criminal moves from place to place. On level 1, he moves very slowly. At level 6, he can move as often as you do. When playing at the higher levels, you must take different measures to capture the criminal. For example, on level 6 you can't catch the criminal by moving to the country he's in, because he'll move before you get there. You must move to a country adjacent to the one he's in and hope that's where he goes. It's also a good idea to position yourself so that the criminal has a limited number of escape routes.

Names of countries are sometimes spelled differently depending upon the reference source. If you enter a country's name and it's refused, just tap the HELP key until you find the spelling used in the game. If you wish to permanently alter the spelling of a country or its capital, change the DATA statements at the end of IBH. You can also do this to update the program when countries change their names or their capitals.

Also note that, in some instances, certain "countries" are actually territories or provinces of other countries. For example, Greenland is under the domain of Denmark, the Falkland Islands are part of the United Kingdom, and so on. For game purposes, these are treated as independent countries.

IBH

```
XQ 5 REM COPYRIGHT 1990 COMPUT
     E! PUBLICATIONS, INC. - A
     LL RIGHTS RESERVED
SC 6 PRINT"{CLR}COPYRIGHT 1990
     ":PRINT"COMPUTE! PUBLICAT
     IONS, INC.":PRINT"ALL RIG
     HTS RESERVED"
DS 10 BANK15:GRAPHIC1,1:GRAPHI
     C0:BLOAD"IBH MAP DATA",B
     0,P8192:FAST:A=RND(-TI)
BE 20 POKE53281,0:POKE53280,0:
     FORA=4869TO5284:READA$:P
     OKEA,DEC(A$):NEXTA
RB 30 FORA=3584TO3711:READA$:P
     OKEA,DEC(A$):NEXTA:KEY1,
     "LOOK"+CHR$(13):POKE250,
     0
XR 40 POKE251,32:DIMCN$(149,1)
     ,X(149),Y(149),AC(149),G
     C(149,14):FORA=1TO149
EE 50 READCN$(A,0),CN$(A,1),X(
     A),Y(A),AC(A):FORB=1TOAC
     (A):READGC(A,B):NEXTB,A
EJ 60 T$(1)="000600":T$(2)="00
     0500":T$(3)="000400":T$(
     4)="000300":T$(5)="00020
     0"
PJ 70 T$(6)="000100":A$="
```

```
      {39 SPACES}"+CHR$(13)
KD 80 SP$="{HOME}"+A$+A$+A$+"
      {HOME}{5}":TB$="{HOME}
      {OFF}{5}{6 SPACES}RRRRRR
      RRRRRRRRRRRRRRRRRR"+C
      HR$(13)
FQ 90 TB$=TB$+" *****INTERNATI
      ONAL BOUNTY HUNTER******
      "+CHR$(13)
FE 100 TB$=TB$+"{6 SPACES}
      {27 Y}{6 SPACES}"
RB 110 FORA=1TO8:MOVSPRA,0#0:M
      OVSPRA,0,0:SPRITEA,0:NE
      XTA
PF 120 PRINT"{CLR}{WHT}
      {6 SPACES}RRRRRRRRRRRR
      RRRRRRRRRRRRR"
XR 130 PRINT" *****{PUR}IN
      {RED}TE{1}RN{YEL}AT{6}I
      O{GRN}NA{BLU}L {WHT}BOU
      NTY HUNTER******"
JJ 140 PRINT"{6 SPACES}{27 Y}"
      :PRINTTAB(12)"{8}
      {3 DOWN}CHOOSE A GAME
      {DOWN}"
CF 150 PRINTTAB(11)" {RVS}
      {CYN} 1 {OFF} {8}COUNTR
      IES{DOWN}":PRINTTAB(11)
      " {RVS}{CYN} 2 {OFF}
      {8}CAPITALS":SLOW:DO:GE
      TKEYA$
QM 160 LOOPUNTILA$="1"ORA$="2"
      :GT=VAL(A$)-1:PRINTTAB(
      12)"{3 DOWN}CHOOSE A LE
      VEL{DOWN}"
QK 170 PRINTTAB(11)" {RVS}
      {CYN} 1 {OFF} {8}EASY T
      O{DOWN}":PRINTTAB(11)"
      {SPACE}{RVS}{CYN} 6
      {OFF} {8}DIFFICULT"
DA 180 GETKEYA$:IFA$<"1"ORA$>"
      6"THEN180:ELSEFAST:TM$=
      T$(VAL(A$))
SB 190 MR=13-2*VAL(A$):PRINT"
      {CLR}":FORA=1144TO2023:
      POKEA,160:NEXTA:SYS4959
      :SYS4989
PE 200 POKE250,0:POKE251,32:PR
      INTTB$:SPRCOLOR2,11:X=0
      :Y=0:MOVSPR1,164,145
JE 210 BC=INT(149*RND(1))+1:SC
      =INT(149*RND(1))+1:IFBC
      =SCTHEN210
GM 220 BN=10000:CS=0:CC=SC:NC=
      SC:SPRITE1,1,1,,,,1:SPR
      ITE2,1,1,,,,1:SLOW:GOSU
      B400
MS 230 IFINT(MR*RND(1))=0ANDCS
      =0THENBC=GC(BC,INT(AC(B
      C)*RND(1))+1):BN=BN-100
QK 240 IFCC=BCANDCS=0THENSPRIT
      E2,0:CS=1:POKE1604,170:
      TI$="000000"
BF 250 IFCS=1ANDTI$>TM$THENCS=
      0:BC=INT(149*RND(1))+1:
      POKE1604,160
HD 260 IFCS=1ANDCC=SCTHEN560
GK 270 GOSUB500:PRINTSP$CN$(CC
      ,1)", "CN$(CC,0)
FS 280 IFCS=1THENPRINTTAB(24)"
      {DOWN}"MID$(TI$,4,1)":"
      RIGHT$(TI$,2)"{3 UP}"
MR 290 PRINT"{DOWN}"TAB(31);:P
      RINTUSING"$##,###";BN:P
      RINT"{2 UP}GO TO: {@}
      {LEFT}";:B$=""
FD 300 GETA$:IFA$=CHR$(20)ANDB
      $<>""THENB$=LEFT$(B$,LE
      N(B$)-1):PRINT"
      {2 LEFT}{@}{LEFT}";:GOT
      O300
RX 310 IFA$=CHR$(13)THEN340
GH 320 IFASC(A$)<32ORASC(A$)>9
      0THEN300
KQ 330 IFA$<>CHR$(34)THENPRINT
      A$"{@}{LEFT}";:B$=B$+A$
      :GOTO300
EF 340 PRINT" ":IFB$="HELP"THE
      N460:ELSEIFB$="LOOK"THE
      N480
XC 350 B=0:FORA=1TO149:IFCN$(A
      ,GT)=B$THENB=A:A=149
KF 360 NEXTA:IFB=0THEN230
GH 370 C=0:FORA=1TOAC(CC):IFB=
      GC(CC,A)THENC=1:A=AC(CC
      )
RP 380 NEXTA:IFC=0THEN230
HP 390 CC=B:NC=CC:GOSUB400:GOT
      O230
KM 400 SPRITE2,0:PRINTTB$:MOVS
      PR1,164,145:A=X(NC):IFA
      >68THENA=68
AC 410 DR=0:IFX<ATHENDR=1
KB 420 IFY<Y(NC)THENDR=DR+128
PF 430 SYS5051,DR,ABS(X-A),ABS
      (Y-Y(NC)):X=A:Y=Y(NC)
RF 440 IFX(NC)>68THENMOVSPR1,1
      64+8*(X(NC)-68),145
FC 450 RETURN
JA 460 PRINTSP$"YOU COULD GO T
      O"
FS 470 PRINTCN$(GC(CC,INT(AC(C
      C)*RND(1))+1),GT):FORTG
      =0TO1000:NEXT:GOTO230
KP 480 SPRITE1,0:SPRITE2,0:POK
      E1562,140:POKE1563,143:
      POKE1564,143:POKE1565,1
      39
SC 490 SYS5156,X,Y:FORA=1562TO
      1565:POKEA,160:NEXT:SPR
      ITE1,1:SPRITE2,1:GOTO23
      0
AR 500 SPRITE2,0:POKE1144,160:
      POKE1183,160:POKE1984,1
      60:POKE2023,160
QQ 510 POKE1164,160:POKE2004,1
      60:POKE1584,160:POKE162
      3,160:IFCS=1THENRETURN
MQ 520 IFX(CC)<X(BC)THENA=1183
      :ELSEIFX(CC)>X(BC)THENA
      =1144:ELSEA=1164
QJ 530 IFY(CC)<Y(BC)THENA=A+84
      0:ELSEIFY(CC)=Y(BC)THEN
      A=A+440
SS 540 POKEA,170:IFABS(X-X(BC)
      )>10ORABS(Y-Y(BC))>11TH
      ENRETURN
EX 550 MOVSPR2,164+16*(X(BC)-X
      ),145+8*(Y(BC)-Y):SPRIT
      E2,1:RETURN
CP 560 PRINTSP$"YOU HAVE EARNE
      D A BOUNTY OF ";:PRINTU
      SING"$##,###";BN
QF 570 PRINT"FOR BRINGING THIS
       CRIMINAL TO JUSTICE."
RC 580 PRINT" PRESS {RVS} RETU
      RN {OFF}":DO:GETKEYA$:L
      OOPUNTILA$=CHR$(13)
JP 590 PRINTSP$"SINCERE THANKS
       FROM THE GOVERNMENT OF
      ":PRINTCN$(SC,0)"."
JC 600 PRINT" PRESS {RVS} RETU
      RN {OFF}":DO:GETKEYA$:L
      OOPUNTILA$=CHR$(13)
EQ 610 PRINTSP$"{DOWN}PLAY AGA
      IN?{2 SPACES}PRESS
      {RVS} Y {OFF} OR {RVS}
      {SPACE}N {OFF}":DO:GETK
      EYA$
EA 620 IFA$="N"THENPOKE53280,1
      3:POKE53281,11:SPRITE1,
      0:PRINT"{CLR}{6}":END
EJ 630 GOTO110
HE 640 DATA A9,00,8D,01,13,A0,
      00,B1
AJ 650 DATA FA,29,F0,6A,6A,6A,
      6A,8D
JG 660 DATA 03,13,B1,FA,29,0F,
      8D,04
QP 670 DATA 13,C8,C0,14,D0,13,
      18,A5
BE 680 DATA FA,69,58,85,FA,A9,
      00,65
MA 690 DATA FB,85,FB,18,A0,00,
      EE,01
MH 700 DATA 13,8C,02,13,A0,00,
      AD,03
JB 710 DATA 13,91,FC,C8,AD,04,
      13,91
CC 720 DATA FC,E6,FC,E6,FC,A5,
      FC,C9
DH 730 DATA 00,D0,02,E6,FD,AD,
      01,13
JG 740 DATA C9,16,F0,06,AC,02,
      13,4C
KH 750 DATA 0C,13,A9,78,85,FC,
      A9,D8
MP 760 DATA 85,FD,60,00,20,00,
      00,00
HK 770 DATA 00,38,A5,FA,E9,58,
      85,FA
XR 780 DATA A5,FB,E9,00,85,FB,
      60,18
BJ 790 DATA A5,FA,69,58,85,FA,
      A5,FB
CB 800 DATA 69,00,85,FB,60,C6,
      FA,A5
QP 810 DATA FA,C9,FF,D0,02,C6,
      FB,60
XC 820 DATA E6,FA,A5,FA,C9,00,
      D0,02
FB 830 DATA E6,FB,60,A5,FA,8D,
      68,13
ED 840 DATA A5,FB,8D,69,13,20,
      5F,13
CP 850 DATA 20,05,13,AD,68,13,
      85,FA
CF 860 DATA AD,69,13,85,FB,60,
      8D,6D
EB 870 DATA 13,29,01,8D,6C,13,
      AD,6D
SM 880 DATA 13,29,80,8D,6D,13,
      8E,6A
AA 890 DATA 13,8C,6B,13,AD,6A,
      13,C9
XQ 900 DATA 00,D0,08,AD,6B,13,
      C9,00
QC 910 DATA D0,01,60,AD,6A,13,
      C9,00
JE 920 DATA D0,0D,AD,6B,13,C9,
      00,D0
XS 930 DATA 1C,20,A0,13,4C,D1,
      13,CE
SP 940 DATA 6A,13,AD,6C,13,C9,
      01,D0
FC 950 DATA 06,20,95,13,4C,E7,
      13,20
JH 960 DATA 8A,13,4C,E7,13,CE,
      6B,13
FM 970 DATA AD,6D,13,C9,80,D0,
      06,20
MG 980 DATA 7C,13,4C,EE,13,20,
      6E,13
DF 990 DATA 4C,EE,13,00,00,00,
      00,8D
DX 1000 DATA 22,14,8E,23,14,A5
      ,FA,8D
JF 1010 DATA 20,14,A5,FB,8D,21
      ,14,AD
AD 1020 DATA 00,DC,C9,7E,D0,13
      ,AD,23
SP 1030 DATA 14,C9,00,F0,F2,20
      ,6E,13
CB 1040 DATA 20,A0,13,CE,23,14
      ,4C,34
AJ 1050 DATA 14,C9,7D,D0,13,AD
      ,23,14
XC 1060 DATA C9,47,F0,DB,20,7C
      ,13,20
```

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AH 1070 DATA A0,13,EE,23,14,4C
        ,34,14
JS 1080 DATA C9,7B,D0,13,AD,22
        ,14,C9
CR 1090 DATA 00,F0,C4,20,8A,13
        ,20,A0
KQ 1100 DATA 13,CE,22,14,4C,34
        ,14,C9
FX 1110 DATA 77,D0,13,AD,22,14
        ,C9,44
BG 1120 DATA F0,AD,20,95,13,20
        ,A0,13
XM 1130 DATA EE,22,14,4C,34,14
        ,C9,6F
MB 1140 DATA D0,9D,AD,20,14,85
        ,FA,AD
BX 1150 DATA 21,14,85,FB,20,A0
        ,13,60
RH 1160 DATA 00,00,00,00,A8,00
        ,02,AA
DJ 1170 DATA 00,0A,AA,00,2F,FA
        ,80,8F
XP 1180 DATA FA,00,07,7A,80,07
        ,7E,00
RK 1190 DATA 3F,FE,00,FF,F8,00
        ,FF,F0
MX 1200 DATA 00,0E,B0,00,0F,F0
        ,00,0F
QQ 1210 DATA F8,55,0B,E8,55,29
        ,68,41
MA 1220 DATA A9,A8,41,AA,A8,41
        ,00,00
HK 1230 DATA 41,00,00,55,00,00
        ,55,00
FG 1240 DATA 00,00,00,00,00,00
        ,00,00
QQ 1250 DATA 00,00,A8,00,23,EA
        ,80,0B
RD 1260 DATA BA,80,07,7A,00,FF
        ,FA,80
MF 1270 DATA FF,FA,00,0A,FE,00
        ,05,B8
MF 1280 DATA 00,0D,F0,00,2F,E0
        ,00,AF
BE 1290 DATA E8,55,AB,A8,55,AB
        ,A8,41
AB 1300 DATA AA,A8,41,00,00,41
        ,00,00
EC 1310 DATA 41,00,00,55,00,00
        ,55,00
XS 1320 DATA AFGHANISTAN,KABUL
        ,50,17,3,62,98,139
EJ 1330 DATA ALBANIA,TIRANE,37
        ,14,2,48,146
AS 1340 DATA ALGERIA,ALGIERS,3
        3,15,7,77,82,83,86,93,
        132,144
JF 1350 DATA ANGOLA,LUANDA,36,
        44,4,15,88,147,148
CE 1360 DATA ARGENTINA,BUENOS
        {SPACE}AIRES,17,61,6,1
        4,16,26,43,101,136
CG 1370 DATA AUSTRALIA,CANBERR
        A,74,61,4,61,91,100,14
        0
MR 1380 DATA AUSTRIA,VIENNA,35
        ,9,6,33,58,66,125,143,
        146
QM 1390 DATA BAHAMAS,NASSAU,11
        ,23,2,31,138
FP 1400 DATA BANGLADESH,DHAKA,
        57,25,2,19,60
CH 1410 DATA BELGIUM,BRUSSELS,
        33,8,4,45,90,135,143
MB 1420 DATA BELIZE,BELMOPAN,8
        ,27,2,50,84
RC 1430 DATA BENIN,PORTO NOVO,
        33,35,4,18,93,94,131
GE 1440 DATA BHUTAN,THIMPHU,57
        ,21,2,27,60
MD 1450 DATA BOLIVIA,LA PAZ,15
        ,51,5,5,16,26,101,102
RR 1460 DATA BOTSWANA,GABORONE
        ,39,54,4,88,116,148,14
        9
HP 1470 DATA BRAZIL,BRASILIA,2
        0,49,11,5,14,28,53,54,
        76,101,102,122,136,141
DD 1480 DATA BULGARIA,SOFIA,38
        ,12,4,48,108,133,146
CF 1490 DATA BURKINA FASO,OUAG
        ADOUGOU,31,31,6,12,47,
        67,82,93,131
XR 1500 DATA BURMA,RANGOON,59,
        29,5,9,27,60,73,129
AE 1510 DATA BURUNDI,BUJUMBURA
        ,40,41,3,109,128,147
XK 1520 DATA CAMBODIA,PHNOM PE
        NH,61,32,3,73,129,142
GS 1530 DATA CAMEROON,YAOUNDE,
        35,35,6,24,25,29,41,46
        ,94
HH 1540 DATA CANADA,OTTAWA,14,
        9,2,49,138
MQ 1550 DATA CENTRAL AFRICAN R
        EPUBLIC,BANGUI,37,35,5
        ,22,25,29,121,147
JK 1560 DATA CHAD,NDJAMENA,37,
        30,6,22,24,77,93,94,12
        1
QD 1570 DATA CHILE,SANTIAGO,14
        ,61,3,5,14,102
RD 1580 DATA CHINA,BEIJING,62,
        13,12,13,19,57,60,73,8
        5,89,95,98,127,139,142
QK 1590 DATA COLOMBIA,BOGOTA,1
        2,35,5,16,38,99,102,14
        1
QJ 1600 DATA CONGO,BRAZZAVILLE
        ,36,40,4,22,24,46,147
EJ 1610 DATA COSTA RICA,SAN JO
        SE,9,33,2,92,99
JD 1620 DATA CUBA,HAVANA,10,25
        ,4,8,55,68,138
XP 1630 DATA CYPRUS,NICOSIA,40
        ,17,1,74
RD 1640 DATA CZECHOSLOVAKIA,PR
        AGUE,35,8,6,7,37,58,10
        4,139,143
HM 1650 DATA DENMARK,COPENHAGE
        N,33,4,2,124,143
HC 1660 DATA DJIBOUTI,DJIBOUTI
        ,44,31,2,42,115
MD 1670 DATA DOMINICAN REPUBLI
        C,SANTO DOMINGO,13,28,
        2,55,106
SR 1680 DATA EAST GERMANY,EAST
         BERLIN,35,6,3,33,104,
        143
GX 1690 DATA ECUADOR,QUITO,11,
        39,2,28,102
RQ 1700 DATA EGYPT,CAIRO,41,20
        ,5,65,70,77,110,121
QE 1710 DATA EL SALVADOR,SAN S
        ALVADOR,8,31,3,50,56,9
        2
XB 1720 DATA EQUATORIAL GUINEA
        ,MALABO,35,37,2,22,46
PB 1730 DATA ETHIOPIA,ADDIS AB
        ABA,43,33,4,35,71,115,
        121
SX 1740 DATA FALKLAND ISLANDS,
        STANLEY,18,71,1,5
AS 1750 DATA FINLAND,HELSINKI,
        36,1,3,96,124,139
FD 1760 DATA FRANCE,PARIS,32,9
        ,6,10,66,119,125,135,1
        43
JP 1770 DATA GABON,LIBREVILLE,
        35,38,3,22,29,41
JQ 1780 DATA GHANA,ACCRA,32,36
        ,3,18,67,131
JP 1790 DATA GREECE,ATHENS,38,
        15,4,2,17,133,146
BB 1800 DATA GREENLAND,GODTHAA
        B,21,0,2,23,59
XM 1810 DATA GUATEMALA,GUATEMA
        LA CITY,7,29,4,11,40,5
        6,84
DB 1820 DATA GUINEA,CONAKRY,29
        ,31,6,52,67,76,82,111,
        112
BB 1830 DATA GUINEA-BISSAU,BIS
        SAU,28,31,2,51,111
HE 1840 DATA GUYANA,GEORGETOWN
        ,17,35,3,16,122,141
MD 1850 DATA FRENCH GUIANA,CAY
        ENNE,18,37,2,16,122
KC 1860 DATA HAITI,PORT-AU-PRI
        NCE,13,27,2,31,36
EM 1870 DATA HONDURAS,TEGUCIGA
        LPA,9,29,4,40,50,68,92
DP 1880 DATA HONG KONG,VICTORI
        A,63,25,1,27
GJ 1890 DATA HUNGARY,BUDAPEST,
        36,10,5,7,33,108,139,1
        46
KC 1900 DATA ICELAND,REYKJAVIK
        ,27,0,3,49,96,135
CS 1910 DATA INDIA,NEW DELHI,5
        3,22,8,9,13,19,27,81,8
        9,98,120
HS 1920 DATA INDONESIA,JAKARTA
        ,62,43,5,6,100,103,113
        ,120
KQ 1930 DATA IRAN,TEHRAN,46,17
        ,5,1,63,98,133,139
ED 1940 DATA IRAQ,BAGHDAD,44,1
        8,6,62,70,72,110,126,1
        33
QC 1950 DATA IRELAND,DUBLIN,30
        ,6,1,135
GC 1960 DATA ISRAEL,JERUSALEM,
        41,19,4,39,70,74,126
PG 1970 DATA ITALY,ROME,34,12,
        4,7,45,125,146
SF 1980 DATA IVORY COAST,ABIDJ
        AN,31,35,5,18,47,51,76
        ,82
DR 1990 DATA JAMAICA,KINGSTON,
        11,28,2,31,56
PH 2000 DATA JAPAN,TOKYO,68,17
        ,2,117,127
DQ 2010 DATA JORDAN,AMMAN,42,2
        0,5,39,63,65,110,126
CB 2020 DATA KENYA,NAIROBI,43,
        38,5,42,115,121,128,13
        4
KD 2030 DATA KUWAIT,KUWAIT CIT
        Y,45,22,2,63,110
BK 2040 DATA LAOS,VIENTIANE,60
        ,27,5,19,21,27,129,142
CE 2050 DATA LEBANON,BEIRUT,41
        ,17,3,32,65,126
HC 2060 DATA LESOTHO,MASERU,39
        ,57,1,116
EX 2070 DATA LIBERIA,MONROVIA,
        29,34,4,16,51,67,112
PG 2080 DATA LIBYA,TRIPOLI,36,
        19,6,3,25,39,93,121,13
        2
XM 2090 DATA MADAGASCAR,ANTANA
        NARIVO,45,50,2,81,87
XG 2100 DATA MALAWI,LILONGWE,4
        1,48,3,87,128,148
XB 2110 DATA MALAYSIA,KUALA LU
        MPUR,61,36,2,113,129
BA 2120 DATA MALDIVES,MALE,52,
        35,3,60,78,120
XF 2130 DATA MALI,BAMAKO,30,29
        ,7,3,18,51,67,83,93,11
        1
BD 2140 DATA MAURITANIA,NOUAKC
        HOTT,28,26,4,3,82,111,
        144
QK 2150 DATA MEXICO,MEXICO CIT
        Y,5,27,3,11,50,138
EE 2160 DATA MONGOLIA,ULAN BAT
        OR,58,9,2,27,139
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BM 2170 DATA MOROCCO,RABAT,31,
        18,3,3,119,144
RD 2180 DATA MOZAMBIQUE,MAPUTO
        ,41,54,7,78,79,116,123
        ,128,148,149
BQ 2190 DATA NAMIBIA,WINDHOEK,
        37,53,4,4,15,116,148
RF 2200 DATA NEPAL,KATHMANDU,5
        5,21,2,27,60
XA 2210 DATA NETHERLANDS,AMSTE
        RDAM,33,6,2,10,143
PA 2220 DATA NEW ZEALAND,WELLI
        NGTON,86,64,2,6,140
AM 2230 DATA NICARAGUA,MANAGUA
        ,9,31,3,30,40,56
BX 2240 DATA NIGER,NIAMEY,33,2
        9,7,3,12,18,25,77,82,9
        4
GB 2250 DATA NIGERIA,LAGOS,34,
        34,4,12,22,25,93
RB 2260 DATA NORTH KOREA,PYONG
        YANG,65,14,3,27,117,13
        9
CD 2270 DATA NORWAY,OSLO,33,1,
        4,44,59,124,139
SQ 2280 DATA OMAN,MUSCAT,48,24
        ,3,110,118,137
GA 2290 DATA PAKISTAN,ISLAMABA
        D,51,18,5,1,27,60,62,1
        39
BC 2300 DATA PANAMA,PANAMA CIT
        Y,11,33,2,28,30
FD 2310 DATA PAPUA NEW GUINEA,
        PORT MORESBY,78,45,3,6
        ,61,114
BS 2320 DATA PARAGUAY,ASUNCION
        ,17,55,3,5,14,16
HF 2330 DATA PERU,LIMA,12,47,5
        ,14,16,26,28,38
KR 2340 DATA PHILIPPINES,MANIL
        A,66,31,2,61,127
DX 2350 DATA POLAND,WARSAW,36,
        6,3,33,37,139
KG 2360 DATA PORTUGAL,LISBON,3
        0,14,1,119
AX 2370 DATA PUERTO RICO,SAN J
        UAN,14,27,2,36,141
HJ 2380 DATA QATAR,DOHA,46,23,
        2,110,137
MR 2390 DATA ROMANIA,BUCHAREST
        ,38,11,4,17,58,139,146
GQ 2400 DATA RWANDA,KIGALI,40,
        39,4,20,128,134,147
FB 2410 DATA SAUDI ARABIA,RIYA
        DH,45,24,9,39,63,70,72
        ,97,107,118,137,145
RJ 2420 DATA SENEGAL,DAKAR,28,
        28,5,51,52,82,83,130
PM 2430 DATA SIERRE LEONE,FREE
        TOWN,29,33,2,51,76
XD 2440 DATA SINGAPORE,SINGAPO
        RE,61,38,2,61,80
KS 2450 DATA SOLOMON ISLANDS,H
        ONIARA,83,43,2,100,140
RD 2460 DATA SOMALIA,MOGADISHU
        ,45,36,3,35,42,71
XJ 2470 DATA SOUTH AFRICA,PRET
        ORIA,39,55,6,15,75,87,
        88,123,149
SH 2480 DATA SOUTH KOREA,SEOUL
        ,65,17,2,69,95
DQ 2490 DATA SOUTH YEMEN,ADEN,
        45,30,3,97,110,145
AF 2500 DATA SPAIN,MADRID,32,1
        3,3,45,86,105
QJ 2510 DATA SRI LANKA,COLOMBO
        ,54,35,3,60,61,81
SG 2520 DATA SUDAN,KHARTOUM,41
        ,29,8,24,25,39,42,71,7
        7,134,147
BQ 2530 DATA SURINAM,PARAMARIB
        O,18,35,3,16,53,54
JD 2540 DATA SWAZILAND,MBABANE
        ,40,56,2,87,116
JJ 2550 DATA SWEDEN,STOCKHOLM,
        35,3,3,34,44,96
XB 2560 DATA SWITZERLAND,BERN,
        33,9,4,7,45,66,143
DK 2570 DATA SYRIA,DAMASCUS,42
        ,17,5,63,65,70,74,133
ME 2580 DATA TAIWAN,TAIPEI,65,
        23,3,27,69,103
AQ 2590 DATA TANZANIA,DAR ES S
        ALAAM,43,43,8,20,71,79
        ,87,109,134,147,148
RP 2600 DATA THAILAND,BANGKOK,
        60,31,4,19,21,73,80
DE 2610 DATA THE GAMBIA,BANJUL
        ,28,29,1,111
SR 2620 DATA TOGO,LOME,32,35,3
        ,12,18,47
EJ 2630 DATA TUNISIA,TUNIS,35,
        16,2,3,77
DE 2640 DATA TURKEY,ANKARA,40,
        14,6,17,48,62,63,126,1
        39
MC 2650 DATA UGANDA,KAMPALA,41
        ,38,5,71,109,121,128,1
        47
QS 2660 DATA UNITED KINGDOM,LO
        NDON,31,6,4,10,45,59,6
        4
BX 2670 DATA URUGUAY,MONTEVIDE
        O,18,61,2,5,16
BC 2680 DATA U.A.E.,ABU DHABI,
        47,23,3,97,107,110
XQ 2690 DATA U.S.A.,WASHINGTON
         D.C.,12,15,5,8,23,31,
        84,139
KC 2700 DATA U.S.S.R.,MOSCOW,4
        0,4,14,1,27,33,44,58,6
        2,85,95,96,98,104,108,
        133,138
QC 2710 DATA VANUATU,PORT-VILA
        ,87,49,3,6,91,114
ED 2720 DATA VENEZUELA,CARACAS
        ,14,32,4,16,28,53,106
DQ 2730 DATA VIETNAM,HANOI,61,
        26,3,21,27,73
DE 2740 DATA WEST GERMANY,BONN
        ,34,8,8,7,10,33,34,37,
        45,90,125
FJ 2750 DATA WESTERN SAHARA,LA
        AYOUNE,29,21,3,3,83,86
FX 2760 DATA YEMEN,SAN'A,44,29
        ,2,110,118
KK 2770 DATA YUGOSLAVIA,BELGRA
        DE,36,11,7,2,7,17,48,5
        8,66,108
KF 2780 DATA ZAIRE,KINSHASA,37
        ,41,9,4,20,24,29,109,1
        21,128,134,148
AP 2790 DATA ZAMBIA,LUSAKA,40,
        48,8,4,15,79,87,88,128
        ,147,149
DR 2800 DATA ZIMBABWE,HARARE,4
        0,50,4,15,87,116,148
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IBH Map Base

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C358:FF 66 66 77 66 66 FF 55 DF
C360:55 66 66 66 FF FF FF FF 5F
C368:FF FF 66 00 00 00 00 DD 9A
C370:DD DD DD 00 00 00 66 66 4D
C378:FF FF 66 66 66 77 77 77 AA
C380:77 77 55 55 FD 55 56 66 F9
C388:66 66 FF 66 62 62 62 66 0B
C390:66 66 66 66 62 FF FF FF 2B
C398:DD DD DD DD DD FF FF 66 75
C3A0:67 76 67 66 67 77 77 76 4B
C3A8:55 FD 55 55 55 56 66 FF 2B
C3B0:FF FF 66 66 66 26 26 FF 83
C3B8:FF 66 66 66 66 00 DD DD D9
C3C0:DD DD 00 00 66 66 66 FF 48
C3C8:66 66 66 77 76 76 77 67 45
C3D0:67 77 76 66 65 55 55 FD 48
C3D8:55 56 66 66 66 64 44 44 65
C3E0:66 66 FF 62 22 66 66 66 39
C3E8:66 62 62 22 22 26 66 66 87
C3F0:66 66 22 66 26 66 66 66 ED
C3F8:66 66 00 00 DD DD DD 00 6F
C400:00 00 00 66 FF FF 76 66 43
C408:66 66 66 76 66 66 66 66 92
C410:66 66 65 55 55 55 55 55 68
C418:55 56 66 66 66 64 44 FF 62
C420:66 66 66 22 66 66 66 66 65
C428:62 22 22 22 22 22 66 66 9E
C430:62 66 66 66 FF 66 66 00 1E
C438:00 00 DD DD DD 00 66 66 7D
C440:66 66 FF 66 66 77 77 77 74
C448:67 67 76 67 76 77 76 66 89
C450:66 66 65 55 55 55 55 55 A8
C458:55 66 66 66 FF FF 62 26 44
C460:66 66 26 66 22 22 22 22 E1
C468:EE 22 66 66 22 66 FF 66 36
C470:00 00 00 00 DD DD 00 00 60
C478:00 06 66 66 66 64 44 66 6A
C480:FF 66 77 77 77 66 66 66 92
C488:77 77 77 76 66 66 66 55 F0
C490:FD FF 66 66 66 64 46 66 04
C498:66 66 66 22 66 66 22 62 51
C4A0:22 EE EE EE 22 66 66 26 61
C4A8:60 DD DD DD 00 66 66 44 1E
C4B0:44 44 44 44 47 77 77 77 B8
C4B8:77 77 66 66 66 66 77 66 31
C4C0:66 67 77 76 66 66 65 55 9A
C4C8:55 55 56 55 66 66 66 FF 0C
C4D0:44 44 52 22 26 66 26 66 77
C4D8:62 22 EE EE EE EE 22 22 82
C4E0:22 20 00 DD DD 00 00 00 50
C4E8:22 26 66 64 44 44 44 44 20
C4F0:77 77 77 77 FE 77 77 77 B6
C4F8:76 66 77 77 76 66 65 55 2B
C500:55 55 56 66 FF 66 66 64 87
C508:47 75 55 22 22 26 26 EE 46
C510:EE EE EE EE 22 22 20 00 75
C518:00 DD DD 02 22 26 44 44 6D
C520:44 44 44 47 77 77 77 76 DA
C528:67 77 FE 77 66 77 77 67 04
C530:66 66 65 55 55 56 66 66 C1
C538:62 22 26 66 66 66 66 64 A6
C540:77 77 55 22 26 62 22 22 53
C548:22 EE EE EE EE EE 22 20 05
C550:00 00 00 DD 00 00 00 06 2C
C558:62 66 44 44 44 44 44 77 AE
C560:77 77 77 FE 77 77 66 76 41
C568:66 66 77 76 66 66 66 55 06
C570:56 66 66 66 66 26 66 66 F2
C578:66 66 64 44 77 76 55 52 34
C580:22 22 EE EE EE EE EE EE 72
C588:DD DD 66 66 66 44 44 44 BE
C590:44 44 47 77 77 77 77 77 AF
C598:66 77 77 77 77 66 66 66 24
C5A0:67 76 66 66 66 66 65 55 9D
C5A8:56 66 66 66 66 FF 44 44 2C
C5B0:77 65 55 52 22 22 22 22 21
C5B8:EE EE EE EE 22 22 22 26 48
C5C0:22 22 22 26 60 00 DD 00 4B
C5C8:00 06 66 66 66 44 44 44 1A
C5D0:66 66 44 77 77 77 FE 77 38
C5D8:76 66 66 66 67 77 66 76 C8
C5E0:66 FF FF 66 66 66 64 47 E2
C5E8:77 66 56 22 22 EE EE EE 50
C5F0:EE EE 22 26 66 22 66 26 05
C5F8:66 60 00 00 00 00 00 00 CF
C600:06 66 66 66 66 64 44 66 11
C608:66 66 64 FE 77 77 77 77 DE
C610:76 66 66 66 77 77 77 76 A4
C618:66 66 66 FF 66 66 66 66 3F
C620:65 66 66 67 77 66 62 22 79
C628:22 22 22 EE EE EE EE 22 B5
C630:22 26 66 66 66 22 66 66 7A
C638:66 66 00 00 00 00 00 00 92
C640:66 66 66 66 64 46 46 66 FC
C648:66 66 64 77 77 FE 77 77 C4
C650:77 76 66 66 77 77 77 76 69
C658:FF FF 66 66 65 56 66 66 D0
C660:77 66 22 22 EE EE EE EE A9
C668:EE 26 66 66 66 62 22 66 91
C670:66 66 60 DD 66 66 66 64 B2
C678:46 FF 64 77 77 77 77 FE B4
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What do the C-64, THE C-128, the Amiga and the IBM all have in common?

Us.

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IBH Map Expand

```
KX 5 REM *** IBH MAP EXPAND **
     *
XQ 10 GRAPHIC1,1:GRAPHIC0:BANK
      0:FAST:OP=50000:NP=8192:
      BLOAD"IBH MAP BASE",B0,P
      50000
AC 20 A=PEEK(OP):IFA>220THEN50
GS 30 POKENP,A:POKENP+1,PEEK(O
      P+1):POKENP+2,PEEK(OP+2)
      :POKENP+3,PEEK(OP+3)
KB 40 POKENP+4,PEEK(OP+4):OP=O
      P+5:GOTO140
PP 50 IFA=255THENB=102:GOTO130
KC 60 IFA=254THENB=119:GOTO130
JP 70 IFA=238THENB=34:GOTO130
BC 80 IFA=239THENB=68:GOTO130
DB 90 IFA=253THENB=85:GOTO130
QH 100 IFA=237THENB=136:GOTO13
      0
AG 110 IFA=221THENB=0:GOTO130
SA 120 IFA=222THENB=17
FA 130 POKENP,B:POKENP+1,B:POK
      ENP+2,B:POKENP+3,B:POKE
      NP+4,B:OP=OP+1
FK 140 NP=NP+5:IFNP<16376THEN2
      0
HJ 150 BSAVE"IBH MAP DATA",B0,
      P8192TOP16376:SLOW
```

G

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EDITOR'S CHOICE

PLANET Raider

Alain Tremblay

The Solar System was once a safe place to live. But that was long ago. Now it's the year 2500, and those infernal droids have returned.

In *Planet Raider*, the droids have positioned eight war satellites around Earth and are preparing to attack. Only a quick strike can stop this mutant life form. Guess what? You've been selected to lead this mission. So ready your troops and blast off for action!

Getting Started

Planet Raider is written entirely in machine language. To type it in, you'll need to use *MLX*, the machine language entry program found elsewhere in this issue. When *MLX* prompts you, respond with the values given below.

Starting address: 0801
Ending address: 1AD0

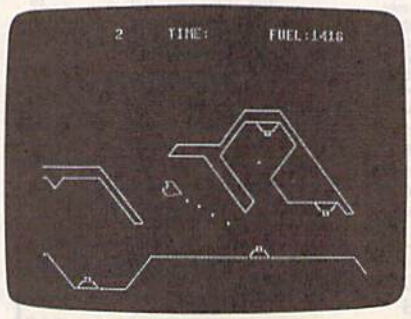
When you've finished typing, be sure to save a copy of the program before exiting *MLX*.

Although it's written in machine language, *Planet Raider* loads and runs like a BASIC program. When you're ready to play the game, plug a joystick into port 2. Then load the program and type RUN.

Note that if you press RUN/STOP–RESTORE after the game begins, you can't restart it by typing RUN. Instead, you must reset the computer and then load and run the program again.

Playing the Game

In *Planet Raider*, your mission is to locate and destroy all the enemy bases that defend the eight droid satellites.



A dangerous surface maze in Planet Raider.

When the game begins, your ship appears in the center of the screen, above the surface of a droid satellite. Across the top of the screen from left to right is your score, the number of ships remaining, the amount of time that you have left to destroy the enemy bases on the current satellite, and a fuel gauge.

To control your ship, use the keyboard. The Commodore key rotates the ship counterclockwise; the left SHIFT key rotates it clockwise. To provide thrust, hold down the cursor-down key. To move in a certain direction, rotate the ship and then thrust. Use a light touch on the keyboard; if you overdo it, you'll lose control of your ship.

To fire on an enemy base, press the cursor-right key. The space bar (or the right SHIFT key) activates your shield/tractor beam. The shield is impenetrable to all fire, both your own as well as that from the enemy bases. Use the shield judiciously since it consumes fuel rapidly. The tractor beam is used for refueling, as described below.

The red objects on the surface of the satellite are the enemy bases, which fire at you periodically. If they hit you or if you contact the satellite's surface, your ship explodes. Also, if you run out of fuel, your ship will crash into the surface and explode.

In order to refuel, you must descend to a fuel depot (they are the blue squares found on every satellite) and activate the shield/tractor beam. Watch the fuel gauge when you refuel. If it goes up, then you're refueling properly; otherwise, move closer to the fuel depot and try again. When the fuel depot is empty, a beep signal will be emitted and the depot will disappear from the screen.

Scoring

If you destroy an enemy base, you're awarded 30 points. When the message MISSION COMPLETE flashes over the time limit, there are no more enemy bases on that satellite. Destroying all the bases on a satellite and leaving it within the time limit shown on the top of the screen adds a time bonus to your score. To travel to the next satellite, thrust upward into outer space over the point where you approached the satellite.

There are eight satellites per level. If you destroy every enemy base on a level, you're awarded two extra ships. You also receive an extra ship when you accumulate 1000 points and another one for every 2000 points thereafter.

Once you've purged all eight satellites of enemy bases, you move to the next level. As you advance from level to level, the gravitational forces exerted by

a satellite on your spaceship alternate between attractive and repulsive. For example, on level 1, gravity pulls you toward a satellite; on level 2, it pushes you away; on level 3, it attracts again; and so on. You'll soon learn that these gravitational forces can be just as dangerous as the enemy fire, especially when it comes to navigating the treacherous mazes found on some satellites.

In addition to the alternating gravitational effects, the satellites (but not the bases) are invisible on levels 3 and 4. The only way to locate their surfaces is to activate your shield/tractor beam. The gravitational and visibility effects repeat after level 4 (level 5 has normal gravity and visibility, level 6 has reverse gravity and normal visibility, and so on).

Finally, if you need to pause the game or restart it once it ends, press RETURN.

Planet Raider

```
0801:0B 08 0A 00 9E 32 30 36 2E
0809:34 00 00 00 00 00 00 20 53
0811:2A 16 20 B7 10 20 D1 13 F2
0819:A2 0A A9 00 85 BB 9D 40 C8
0821:03 A9 C8 9D F8 07 CA 10 99
0829:F1 86 BE A9 35 85 BA A9 25
0831:C1 8D F9 07 A9 D0 8D F8 D9
0839:07 A9 15 8D 45 03 A9 93 CF
0841:A2 18 8D C0 13 8E C1 13 CF
0849:86 BF 20 C6 12 A2 AA A5 13
0851:BB 29 10 85 BC D0 02 A2 B3
0859:FF 8E 08 38 4A 09 05 8D 9F
0861:21 D0 A9 93 8D 00 D0 8D 40
0869:01 D0 20 44 E5 A9 48 85 62
0871:B3 A5 BB 29 08 49 D8 85 6B
0879:B6 A2 01 86 E8 86 E9 CA 16
0881:A0 84 84 09 96 2E 88 D0 73
0889:FB A0 03 20 23 12 20 EF B3
0891:0F 20 34 14 20 1F 0B 20 AC
0899:17 0C A5 35 D0 22 A5 44 DE
08A1:F0 1E A5 41 38 E5 42 85 DD
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08B1:85 43 8D 08 D4 E9 1C D0 DE
08B9:07 85 44 A9 10 8D 0B D4 73
08C1:AD 1E D0 AD 1F D0 A8 4A FC
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08D1:0F A2 08 98 3D 74 0F F0 67
08D9:03 20 5B 0F CA CA 10 F3 65
08E1:20 41 0E A5 33 F0 03 4C 1E
08E9:FE 0C A5 B3 C9 40 F0 04 A1
08F1:C5 B5 D0 03 4C 4B 0D C6 0D
08F9:48 10 99 A9 20 85 48 AE 56
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0911:E8 A9 16 8D 00 DC AD 01 6D
0919:DC C9 FD D0 0A CD 01 DC 3F
0921:F0 FB CD 01 DC D0 FB 85 1C
0929:C5 09 DF C9 DF D0 01 CA 08
0931:C6 3D 10 0C A9 04 85 3D 5E
0939:8A 29 0F 09 D0 8D F8 07 03
0941:A5 C5 09 FB A6 C6 85 C6 9A
0949:C9 FB D0 01 E8 D0 7F A5 98
0951:46 30 74 A2 0A CA CA 30 8C
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0961:F8 07 20 3A 0A 84 03 A6 68
0969:02 AD 15 D0 1D 74 0F 8D FD
0971:15 D0 E8 A0 01 B9 00 D0 29
0979:9D 06 D0 B9 2F 00 4A 85 25
0981:02 B9 22 00 F0 04 A9 FF 32
0989:D0 02 A9 01 95 92 59 E8 5C
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09A9:49 FF A8 B5 92 49 FE 95 1E
09B1:92 98 A8 B9 00 C6 95 7E A8
09B9:95 88 A5 03 18 69 04 85 91
09C1:03 A4 04 CA 88 10 AE A9 37
09C9:70 A2 20 20 A1 10 A6 4C A9
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09D9:A5 C5 09 EF C9 EF D0 15 15
09E1:86 BD EE 27 D0 A5 46 30 D0
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09F1:20 80 10 86 34 86 46 A5 8C
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0A19:34 20 3A 10 90 0E 84 4C A9
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0A39:60 8A 29 07 A8 8A 29 08 7F
0A41:85 22 A9 08 E0 DC B0 06 38
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0A51:60 20 3A 0A A2 00 B5 3F 45
0A59:29 03 48 B5 E8 29 08 55 78
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0A69:C9 04 90 28 B0 11 68 38 CA
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0A79:0A B5 E8 49 FE 95 E8 F6 C8
0A81:2F 30 F2 48 84 22 B4 2F 61
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0A99:C8 C8 E8 E0 02 D0 B7 60 92
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0B11:A2 0F 16 5E 16 5E CA 10 B4
0B19:F9 86 42 A4 03 60 C6 A7 2F
0B21:D0 18 A5 BE 85 A7 C6 AB 4A
0B29:10 10 A5 0A 29 07 85 AB BC
0B31:A2 0E B4 5E F0 05 CA CA 94
0B39:10 F8 60 86 02 4A 90 01 65
0B41:88 C8 C4 31 B0 F4 AD 12 40
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0C31:6E D0 24 B5 5E 95 6E 46 01
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0C59:C6 FF 10 D3 CA CA A5 02 E2
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0C71:85 25 BD 90 C4 85 24 A0 7B
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0C81:F8 B4 D8 B9 F6 0C 48 B4 27
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0D31:68 11 A6 31 D0 F7 8E 47 76
0D39:03 A9 15 8D 45 03 4C 4E D7
0D41:08 C7 C1 CD C5 20 CF D6 8B
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0D51:D0 7B 85 BF A2 0C BD EE 0F
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0DF9:D5 D3 3D 32 30 2A CC C5 48
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0E31:D3 C8 C9 D0 D3 21 DC D4 61
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0E79:0C A8 F0 69 BE 36 0E 20 85
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0EA9:0E D0 03 88 D6 02 98 9D 77
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0EC1:F0 0B B4 7E F0 03 20 18 83
0EC9:0F CA CA 10 F1 A2 09 A5 4C
0ED1:03 F0 0B B4 7D F0 03 20 2E
0ED9:18 0F CA CA 10 F1 4C AD 5A
0EE1:11 60 70 F8 B0 A2 08 86 E2
0EE9:FF B5 7E F0 1F D6 9D 10 F1
0EF1:1B A9 02 95 9D 4A 85 FF C0
0EF9:D6 88 D0 09 B5 7E 95 88 A9
0F01:B5 92 20 18 0F E8 C6 FF CD
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0F29:0A C9 FF D0 09 AD 10 D0 BB
0F31:3D 75 0F 8D 10 D0 8A 4A 29
0F39:B0 12 AD 10 D0 3D 74 0F 5E
0F41:D0 05 C0 08 F0 14 60 C0 FA
0F49:48 F0 0F 60 C0 3C F0 04 8C
0F51:C0 F8 D0 05 CA 20 5B 0F 15
0F59:E8 60 A9 00 85 FF 95 7E 0F
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0F69:D0 AD 10 D0 3D 75 0F 8D D5
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0F79:DF 40 BF 80 7F A5 3C F0 93
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0F89:32 10 68 0A 85 47 20 3A 36
0F91:10 A5 3B F0 0C A9 30 20 1F
0F99:27 10 20 32 10 C6 3B D0 59
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0FB9:0A 04 88 10 F7 84 B9 60 95
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1049:24 A2 03 86 23 E8 86 25 DB
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1179:D0 04 A9 FE 85 09 C6 31 39
1181:C4 31 F0 A1 B9 01 C1 99 79
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12B9:C9 C1 D0 02 86 09 E8 C8 60
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1341:A7 D0 04 E6 23 E6 23 C6 20
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1361:A9 00 9D 81 C0 E6 B3 4C 7D
1369:E9 12 C6 02 D0 03 4C DC 0A
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1381:F6 85 B8 A2 A0 A9 C8 9D A0
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1391:40 85 23 85 25 A5 B4 85 A4
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13A1:B4 D0 17 A5 B5 E9 3F AA 12
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1439:03 A9 84 8D 14 03 A9 7F 36
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1509:AD 12 D0 C9 1E B0 03 4C 4B
1511:BC 15 20 F1 15 A6 09 30 87
1519:66 BD C0 C0 8D 02 D0 BD DD
1521:E0 C0 8D 03 D0 A9 FD D0 C7
1529:43 A6 06 86 05 A9 00 8D 24
1531:1D D0 8D 17 D0 BD 20 C1 C0
1539:D0 05 20 75 11 F0 40 A0 D5
1541:04 C9 C1 B0 14 30 03 8C 17
1549:1D D0 C9 80 B0 03 8C 17 39
1551:D0 38 E9 10 9D 20 C1 A9 CA
1559:C0 8D FA 07 BD E0 C0 69 73
1561:02 8D 05 D0 BD C0 C0 8D 9D
1569:04 D0 A9 FB BC 40 C1 D0 F9
1571:06 2D 10 D0 4C 7D 15 49 C4
1579:FF 0D 10 D0 8D 10 D0 A6 EA
1581:31 A9 FF 85 07 A9 3A D0 2B
1589:07 E4 09 F0 11 BD E0 C0 A2
1591:18 ED 12 D0 90 08 C5 07 C9
1599:B0 04 86 06 85 07 CA 10 3C
15A1:E8 A9 14 E6 07 F0 0E A4 58
15A9:06 B9 E0 C0 C4 31 90 05 7E
15B1:E8 86 07 A9 3A 8D 12 D0 6A
15B9:4C 81 EA A9 08 8D 16 D0 D5
15C1:A9 1B 8D 11 D0 A0 00 8C DF
15C9:05 D0 8C 03 D0 A2 80 A5 24
15D1:32 F0 10 E6 32 C9 F8 D0 3D
15D9:09 C8 8C 01 D4 A9 40 8D B7
15E1:00 D4 E8 8E 04 D4 C6 0A 52
15E9:D0 95 A9 84 85 0A D0 8F E4
15F1:A5 37 05 BD 8D 16 D0 A5 45
15F9:38 18 69 13 29 17 8D 11 76
1601:D0 A5 35 F0 23 C6 36 D0 26
1609:1F A9 05 85 36 C6 35 D0 30
1611:05 A6 09 20 75 11 A5 08 CF
1619:49 01 8D 0B D4 85 08 29 82
1621:01 0A 4D 15 D0 8D 15 D0 03
1629:60 A9 00 85 FF 20 D3 16 86
1631:A2 10 91 22 C8 D0 FB E6 6F
1639:23 CA D0 F6 A9 30 8D 1F 7B
1641:32 8D 22 32 20 D3 16 AD 7B
1649:47 17 91 22 C8 EE 49 16 DD
1651:D0 03 EE 4A 16 DE 20 17 AC
1659:10 ED E8 E0 09 D0 E5 86 12
1661:05 A9 06 85 03 20 D3 16 E9
1669:A2 3C A9 03 85 02 B1 22 15
1671:84 04 48 8A A8 68 91 24 C0
1679:B1 22 A4 04 91 24 E8 C8 93
1681:C6 02 D0 EA 8A 38 E9 06 69
1689:AA 10 DF C6 03 D0 D6 20 A0
1691:D3 16 A9 15 85 04 A9 03 46
1699:85 03 A2 07 B1 22 0A 90 C8
16A1:09 48 BD 2C 14 11 24 91 9D
16A9:24 68 CA 10 F1 E6 22 C6 92
16B1:24 C6 03 D0 E5 A5 24 18 35
16B9:69 06 85 24 C6 04 D0 D6 CD
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1769:00 C3 00 03 C3 C0 03 C3 A3
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1779:00 00 00 82 00 00 82 00 D4
1781:00 82 00 00 82 00 00 82 E6
1789:00 00 AA 60 0F FC F0 00 61
1791:07 98 00 03 0C 00 01 98 94
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17A1:30 00 00 30 00 00 30 00 4B
17A9:00 30 00 00 30 00 00 30 95
17B1:00 00 30 00 00 30 00 00 A6
17B9:30 7E 00 00 66 00 00 66 39
17C1:00 03 FF C0 06 00 60 0C B9
17C9:00 30 18 00 18 30 00 0C 94
17D1:60 00 06 10 00 00 38 00 62
17D9:00 6C 00 00 C6 00 00 C6 20
17E1:00 01 83 00 01 83 00 03 D9
17E9:01 80 03 01 80 06 00 C0 06
17F1:06 00 C0 0C 00 60 0C 7C 12
17F9:60 06 C6 C0 03 83 80 03 E8
1801:00 00 0F 00 00 19 80 00 78
1809:31 80 00 61 80 00 C1 80 10
1811:03 81 80 06 01 80 0C 00 B5
1819:C0 0C 00 C0 0C 00 C0 0C A6
1821:E0 C0 07 19 80 00 0F 00 86
1829:00 06 03 E0 00 0E 60 00 42
1831:78 60 03 C0 60 0E 00 C0 1E
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1841:80 0F 81 80 00 E1 80 00 36
1849:63 00 00 37 00 00 3E 01 1C
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1891:01 80 00 5F 12 14 04 34 75
1899:36 2C 01 2C 22 64 10 11 A6
18A1:60 16 06 16 24 17 16 34 87
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18B9:0D 05 0D 13 25 17 10 00 2A
18C1:69 66 24 26 44 22 02 22 F7
18C9:14 01 14 26 62 23 42 44 91
18D1:04 44 46 27 26 06 26 52 38
18D9:02 12 64 46 24 26 64 01 04
18E1:14 04 74 42 08 50 5B 46 4E
18E9:64 22 35 05 35 23 45 10 9C
18F1:00 5C C4 0A 0D 05 15 0B 24
18F9:1D 13 12 1C 01 4C 04 14 D6
1901:0F 1E 0F 25 0E 4C 12 64 A0
1909:16 1C 0E 06 16 2C 16 1C 19
1911:1A 0B 17 2B 0A 02 1A 26 5B
1919:0A 1B 1C 04 24 1F 0E 22 B6
1921:36 08 2C 5B 34 0F 25 0B DE
1929:08 4C 55 0E 32 0B 27 07 11
1931:17 10 00 5A EC 42 02 42 4F
1939:6B 03 1B 82 A3 03 63 22 7F
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1951:07 3F C6 06 46 0F 07 7F 0C
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1961:01 F4 04 EC 01 14 C2 A3 22
1969:03 63 0A 02 7A 43 03 43 81
1971:0D 05 ED 4D 05 4D F5 05 4C
1979:0D 47 F6 06 16 6F 07 1F DE
1981:76 06 16 47 46 10 00 5D 77
1989:32 1E 1A 0C 01 14 36 1A 3F
1991:1C 1E 4C 1A 1C 04 4C 1E 2C
1999:0C 01 14 04 1C 1E 1C 1A 80
19A1:1C 1A 0C 04 2C 1E 64 04 D0
19A9:64 08 06 57 0E 6C 0A 2D A9
19B1:0B 0F 45 08 18 57 0E 6C FC
19B9:0A 3D 05 45 08 2A 56 0E D8
19C1:2C 0A 54 0A 8D 0F 08 3F AF
19C9:55 0E 8C 2A 0D 27 25 0B B8
19D1:0F 3D 05 15 0B 0A 0D 17 7E
19D9:08 59 53 0E 2C 1E 24 4A 1E
19E1:0D 0F 0D 05 2D 17 1E 17 69
19E9:0D 05 1D 1B 22 0B 2F 25 F9
19F1:10 00 5A A4 01 FC 0A 1D EE
19F9:05 7D 23 22 33 25 37 15 46
1A01:05 15 43 4A 1E 06 16 1A 59
1A09:26 3C 01 3C 22 1B 03 0B D1
1A11:3D 23 22 02 12 2E 1C 04 96
1A19:1C 1E 17 2E 6C 42 23 22 7D
1A21:0C 46 06 26 2C 1E 17 07 1F
1A29:0F 35 23 03 13 1F 13 1F 21
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1A39:1C 22 1C 1E 06 26 27 0D 8D
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1A49:08 39 60 12 02 12 13 1D 98
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1A61:32 24 01 24 17 07 67 07 C4
1A69:6F 96 0F 07 17 1E 4C 1A 31
1A71:7B 3C 04 14 1A 24 04 2C C9
1A79:32 1D 0F 07 17 1D 1B 32 F5
1A81:34 1E 0C 01 2C 1E 1A 02 F8
1A89:1A 33 1D 33 65 37 1E 1F D1
1A91:07 1F 1D 33 32 02 4A 7C 92
1A99:4E 2C 04 24 36 06 66 37 90
1AA1:36 37 1D 63 0F 1E 1F 0E D5
1AA9:06 16 1C 1F 4B 22 1D 4F 48
1AB1:4E 94 01 64 08 33 5A 1A 74
1AB9:0B 03 2B 7A 4D 4F 15 05 18
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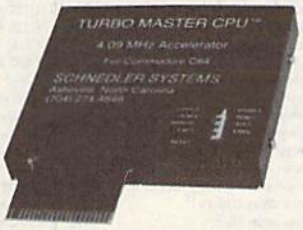

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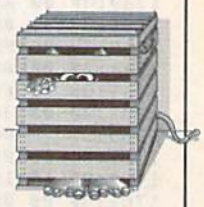

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Future Computing

Neural Networks

Part 3

Kevin E. Martin

In the final installment, the author presents the competitive learning model and a program to go with it.

Competitive learning (CL) is the focus of most of today's neural-network research. After you read about how the algorithm works, you can experiment with the program at the end of the article. The program implements the competitive-learning algorithm with a complete interface to BASIC.

In February, I discussed the back-propagation algorithm. It is in the associator class of neural-network models, but it was not developed from evidence from neurophysiology or even from psychology. The CL model is a much more biologically plausible model, and it exhibits many of the features we find in our own brain.

Competitive learning belongs to the class of self-organizing neural networks. These models take the salient features of the input domain and organize themselves so as to internally represent these features. Because they detect the features of the input domain, they can learn how to statistically classify the domain into several categories. This is especially useful when the network has to learn how to recognize damaged or distorted objects or patterns.

Like back propagation, competitive learning has layers of PEs (Processing Elements) and connections between the layers, but the similarities stop there. Each of the layers in the CL networks are broken up into groups of PEs where no PE can belong to more than one group. All of the PEs in these groups receive their input from the previous layer, and then they compete to see who gets to output from their group. Only one PE can output its signal from its group.

There is no teacher vector in CL, because the network organizes itself into recognizing the features of the input domain. This is quite a bit more like our own brain, since the vast majority of the cells in our own brain have no connection directly to the outside world and therefore do not receive any teacher input. We can adapt to almost any type of environment, and the CL neural network is leading us toward developing a neural-network model that actually can adapt itself to any environment.

Another feature different from the previous networks we have seen is that we have connections not only between layers, but also within a layer. These intralayer connections are only between PEs within the same group, and they are inhibitory. So, if one PE gets a stronger input signal from the previous layer, it will inhibit its neighbors. In doing so, it becomes stronger and is said to be "winning the competition." Then, after a winner is determined, it outputs its signal to the next layer. The connections between layers are all excitatory, which will cause another competition to occur in the next layer.

The learning algorithm is very simple. All the weights in the connection matrix which lead from all the cells in the previous layer to a single cell in the current layer (that is, a row in the connection matrix) must sum to 1. This keeps the weights evenly distributed, and no PE in the group will get too strong. When a PE in a group wins a competition, it gets to learn, and the weights are changed according to a mathematical learning rule. Since all the weights must sum to 1, when a PE learns, the weight for connection between the current PE and the active PEs in the previous layer becomes stronger, and the weight for connection between the current PE the inactive PEs becomes weaker. This causes the PE that won the competition to become more likely to recognize the pattern when it appears again.

Although competitive-learning neural networks are more like the brain in many respects, they still have several limitations. First, each of the clusters should learn different patterns, but in this scheme, there are no provisions which keep them from learning the same patterns. If two

clusters' weights are similar, they will tend to learn the same pattern. A simple fix for this problem is to have each of the clusters repel each other (that is, to have inhibitory connections between the clusters).

The linear-associator and back-propagation neural networks were able to associate two different patterns. This is a very important type of learning. The competitive-learning neural network can't learn to associate two patterns, but if it were combined with another network scheme, such as back propagation, then we would have a very powerful network architecture able to classify patterns and associate these classifications as well as the patterns themselves.

Since the size of the competitive-learning networks are limited to a certain number of clusters, they can classify the inputs into a limited number of categories. This limitation does not become apparent until the number of natural classifications of the inputs exceeds the number of clusters the CL network contains. In this situation, the network will classify the extra classes into categories in which they do not belong. This can be solved by simply adding more PEs and more clusters in the layers.

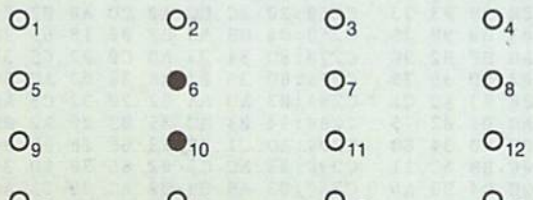
The largest problem, and the most difficult to solve, is the problem of stability. The CL network should, after a certain amount of time, stabilize each of its weights to a final value. After this, the weight change from subsequent training should not move the weights. But the weights in a CL network significantly change even after a long period of training. This problem has been solved by another neural network, Adaptive Resonance Theory (ART). For a discussion of ART, see *Neural Computing: Theory and Practice*, by Philip Wasserman.

The field of neural computing has grown rapidly since its rebirth in 1982, but there is still much more research to be done. Over the next several years, many new neural-network architectures will be developed and implemented. The applications will become wider and wider, but we are still a very long way from the day when every home has a computer to talk to.

Hands On

The accompanying program performs graph partitioning. It takes inputs and classifies them into two distinct groups (one for each PE in the second layer). The first layer of PEs is arranged in a grid shape shown in Figure 1. The inputs are dipoles; that is, only two PEs in the input pattern are allowed to be 1, and the rest are set to 0. In order to determine the correct classifications, there must be some order to the input patterns. To accomplish this, we limit the inputs to dipoles which are adjacent to each other along a horizontal or vertical line of the grid. As shown in Figure 1, only two PEs are active (blackened) and the rest are inactive (open). There are 24 possible dipole inputs, and each of these must be presented during a training run.

Figure 1: Graph Partitioning



What's startling about this example is that the program classifies the inputs into two distinct groups without any teacher. The groups are equally distributed; that is, they accept approximately equal numbers of patterns. They are also divided into very logical halves. If we were asked to divide the grid shown in Figure 1 into two distinct, equally distributed groups, we would most likely divide them between the second and third columns or between the second and third rows. This is exactly what the graph-partitioning example does. It divides the graph (the grid) into two halves horizontally or vertically and sometimes (though not very often) along the diagonal.

The competitive-learning example program is divided into two parts. The majority of the work is performed by the machine language routines. To type these in, you'll need *MLX*, the machine language entry program found elsewhere in this issue. The *MLX* prompts, and the values you should enter, are as follows:

Starting address: **C000**
Ending address: **C98F**

Once you've finished entering the data, save a copy of the routines to disk with the name CL.ML. The BASIC program expects to find a file with this name.

The graph-partitioning program is written in BASIC; it calls the machine language routines. To avoid typing errors, you should use *The Automatic Proofreader*, also found in this issue, while entering it. Save a copy of the program to the same disk that contains CL.ML.

The CL example program, Dipole, is very simple. In line 40, I initialize the random-number generator. The CL network is initialized by calling the machine language routine at 49152 with the following parameters: the number of PEs in the first layer, the number of PEs in the second layer, the number of patterns to learn, and the learning rate. An example of this is shown in line 60 of the example program.

This initialization sets up all the variables used by the program. These variables are standard BASIC variables and arrays and are described in the following table.

Variable	*Meaning*
p1	Number of PEs in layer 1
p2	Number of PEs in layer 2
np	Number of patterns for the system to learn
rate	Learning rate
Array (Size)	*Meaning*
o2(p2)	Output from layer 2
w1(p2,p1)	Connection weights between layers 1 and 2
in(p1,np)	Input patterns

Remember that these variables and arrays are erased if you perform a NEW or CLEAR command, load another program, or change the existing program.

Before training the network, all of the input patterns must be presented to the system. To do this, use the command SYS 49167 followed by the number of the pattern and then the pattern itself. The pattern should consist of 1s and 0s and should be enclosed within quotation marks. The first number corresponds to the activation of the upper left PE in the input layer. The rest of the PEs are numbered from left to right as shown in Figure 1. (See lines 80–310 for an example of this.)

Now the CL network is ready to learn. To teach it the patterns, simply enter SYS 49164 followed by the number of times you want the patterns to be presented. If you

specify a large number, the program will take some time to complete because each time you present a set of patterns it takes nearly 15 seconds. In order to properly train the network, you need to train it several hundred times. For 400 training runs, it takes over 60 minutes to train the network.

Once the network has been trained, you should save the current values so that another long training run will be unnecessary. To do this, type SYS 49170 followed by the filename in quotation marks. To reload the network, use SYS 49173 followed by the filename in quotation marks.

Now that the network has been trained and saved for further study, the network will correctly classify patterns according to the rules it derived. It will correctly classify all the patterns you used to teach it, but it will also classify patterns you did not teach it. This is one of the most powerful features of the CL network. If you want the program to recognize a pattern, type SYS 49155 followed by the input pattern in quotation marks. The input pattern should consist of 1s and 0s, and its length should be equal to p1 (the number of PEs in the first layer). After this, the output pattern will be in o2.

In the graph-partitioning program, the display consists of four parts. The first part consists of a 4 × 4 grid of weights on the connections between the PEs in the first layer and the first PE in the second layer. The next part is the total weight of all the weights on the connections in the 4 × 4 grid above it. The third part consists of another 4 × 4 grid of weights on the connections between the PEs in the first layer and the second PE in the second layer. The final part is the total weight of all the weights on the connections in the second grid. Each of these numbers is out of 1,000,000.

The total of all the weights should remain at or close to 1,000,000. This keeps the symmetry of the distribution of the weights and is vital to the functioning of the CL network. As the program progresses, the weights will become stronger on one side of the grid. Each grid should have weights that look like mirror images of each other. Figure 2 shows the weights after 400 training trials. Notice that the grid has been partitioned into two groups. If a dipole that is on the left side of the grid is presented, the first PE in the second layer will be active. If it is on the right side of the grid, the second PE in the second layer will be active.

Figure 2: Weights

63653	67248	0	0
122666	141174	3283	0
142081	192964	61438	0
87442	91651	26394	0
999994			
0	40386	135818	67980
0	49159	200137	125781
0	2167	91572	108784
0	0	80543	97667
999994			

Sources

If you're intrigued by neural computing, check your library or university bookstore for the books listed below.

Neural Computing: Theory and Practice
By Philip Wasserman
From Van Nostrand Reinhold

Neurocomputing: Foundations of Research
Edited by James A. Anderson and Edward Rosenfeld
From MIT Press

Parallel Distributed Processing (two volumes)
Explorations in Paralled Distributed Processing
By Rumelhart, McClelland, and the PDP Research Group
From MIT Press

Note: To understand the models presented in these books, you'll need to have an understanding of linear algebra and elementary calculus.

CL

```
C000:4C 18 C0 4C 47 C2 EA EA 90
C008:60 EA EA 60 4C FD C5 4C 0A
C010:31 C6 4C E8 C6 4C F0 C7 05
C018:20 FD AE 20 9E B7 8E A9 9B
C020:02 20 FD AE 20 9E B7 8E CE
C028:AA 02 20 FD AE 20 9E B7 4E
C030:8E AC 02 20 FD AE A5 7A D6
C038:8D A7 02 A5 7B 8D A8 02 6A
C040:A9 58 85 7A A9 C9 85 7B FF
C048:20 8B B0 8D AD 02 8C AE E8
C050:02 AD A7 02 85 7A AD A8 6D
C058:02 85 7B 20 8A AD AE AD C3
C060:02 AC AE 02 20 D4 BB A5 75
C068:7A 8D A7 02 A5 7B 8D A8 7E
C070:02 A9 5B 85 7A A9 C9 85 B4
C078:7B 20 8B B0 48 98 48 AD 1F
C080:A9 02 20 3C BC 68 A8 68 60
C088:AA 20 D4 BB A9 5E 85 7A 0A
C090:A9 C9 85 7B 20 8B B0 48 9A
C098:98 48 AD AA 02 20 3C BC 9E
C0A0:68 A8 68 AA 20 D4 BB A9 AD
C0A8:61 85 7A A9 C9 85 7B 20 A1
C0B0:8B B0 48 98 48 AD AC 02 0B
C0B8:20 3C BC 68 A8 68 AA 20 D3
C0C0:D4 BB A9 35 85 7A A9 C9 57
C0C8:85 7B AD 35 C9 20 81 B0 77
C0D0:A9 64 85 7A A9 C9 85 7B 93
C0D8:20 8B B0 8D B3 02 8C B4 AF
C0E0:02 A9 01 20 3C BC AE B3 D5
C0E8:02 AC B4 02 20 D4 BB A9 C2
C0F0:6A 85 7A A9 C9 85 7B 20 6E
C0F8:8B B0 8D C1 02 8C C2 02 04
C100:A9 01 8D 36 03 A9 00 8D F9
C108:38 03 A9 72 85 7A A9 C9 F7
C110:85 7B 20 8B B0 8D BF 02 2F
C118:8C C0 02 AD 38 03 D0 11 AD
C120:A9 00 20 3C BC AC C0 02 5C
C128:AE BF 02 20 D4 BB 4C 75 D8
C130:C1 A9 01 20 3C BC 20 97 CD
C138:E0 AD BF 02 8D 34 03 AD A0
C140:C0 02 8D 35 03 AC 36 03 E3
C148:AE 38 03 AD AA 02 20 92 9C
C150:C3 AC 35 03 AE 34 03 20 24
C158:D4 BB AD BF 02 AC C0 02 2D
C160:20 A2 BB AD 34 03 AC 35 2B
C168:03 20 67 B8 AE BF 02 AC 13
C170:C0 02 20 D4 BB EE 38 03 33
C178:AD A9 02 CD 38 03 B0 9B 25
C180:A9 01 8D 38 03 AD BF 02 9E
C188:8D 34 03 AD C0 02 8D 35 79
C190:03 AC 36 03 AE 38 03 AD C1
C198:AA 02 20 92 C3 AD BF 02 75
C1A0:AC C0 02 20 A2 BB AD 34 80
C1A8:03 AC 35 03 20 0F BB AC 11
C1B0:35 03 AE 34 03 20 D4 BB A6
C1B8:EE 38 03 AD A9 02 CD 38 26
C1C0:03 B0 C2 EE 36 03 AD AA FC
C1C8:02 CD 36 03 90 08 A9 00 AF
C1D0:8D 38 03 4C 1B C1 A9 7A FB
C1D8:85 7A A9 C9 85 7B 20 8B 75
C1E0:B0 8D C3 02 8C C4 02 AD E1
C1E8:B3 02 38 E5 2F 8D B3 02 45
C1F0:AD B4 02 E5 30 8D B4 02 3A
C1F8:AD BF 02 38 E5 2F 8D BF CD
C200:02 AD C0 02 E5 30 8D C0 F5
C208:02 AD C1 02 38 E5 2F 8D 97
C210:C1 02 AD C2 02 E5 30 8D 6E
C218:C2 02 AD C3 02 38 E5 2F 5D
C220:8D C3 02 AD C4 02 E5 30 A2
C228:8D C4 02 AD AD 02 38 E5 8C
C230:2D 8D AD 02 AD AE 02 E5 97
C238:2E 8D AE 02 AD A7 02 85 C3
C240:7A AD A8 02 85 7B 60 A9 28
C248:00 8D BB 02 20 49 C6 A9 26
C250:01 8D 36 03 A9 00 8D C5 DE
C258:02 A9 01 8D 38 03 A9 00 63
C260:20 3C BC A2 CD A0 02 20 DB
C268:D4 BB AD BF 02 18 65 2F 63
C270:8D 34 03 AD C0 02 65 30 0E
C278:8D 35 03 AE 38 03 AC 36 BA
C280:03 AD AA 02 20 92 C3 AD E8
C288:34 03 AC 35 03 20 A2 BB 6B
C290:AD C1 02 18 65 2F 8D 34 56
C298:03 AD C2 02 65 30 8D 35 BF
C2A0:03 AE BB 02 AC 38 03 AD E4
C2A8:A9 02 20 92 C3 AD 34 03 F0
C2B0:AC 35 03 20 28 BA A9 CD 89
C2B8:A0 02 20 67 B8 EE 38 03 7E
```

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C2C0:AD A9 02 CD 38 03 B0 9B 6F
C2C8:AD C5 02 D0 08 A9 01 8D 5A
C2D0:C5 02 4C 24 C3 A2 CD A0 6A
C2D8:02 20 D4 BB AD B3 02 18 16
C2E0:65 2F 8D 34 03 AD B4 02 14
C2E8:65 30 8D 35 03 AD C5 02 8E
C2F0:20 78 C3 AD 34 03 AC 35 34
C2F8:03 20 A2 BB A9 CD A0 02 DF
C300:20 5B BC 48 A9 00 20 3C 54
C308:BC 68 C9 01 F0 16 AE 34 C2
C310:03 AC 35 03 20 D4 BB AD 94
C318:36 03 8D C5 02 A9 CD A0 7C
C320:02 20 A2 BB AD B3 02 18 19
C328:65 2F 8D 34 03 AD B4 02 5D
C330:65 30 8D 35 03 AD 36 03 B9
C338:20 78 C3 AE 34 03 AC 35 8D
C340:03 20 D4 BB EE 36 03 AD AB
C348:AA 02 CD 36 03 90 03 4C 6F
C350:59 C2 AD B3 02 18 65 2F 90
C358:8D 34 03 AD B4 02 65 30 97
C360:8D 35 03 AD C5 02 20 78 26
C368:C3 A9 01 20 3C BC AE 34 C4
C370:03 AC 35 03 20 D4 BB 60 A7
C378:AA E8 CA F0 14 AD 34 03 BA
C380:18 69 05 8D 34 03 AD 35 26
C388:03 69 00 8D 35 03 4C 7A 8D
C390:C3 60 8D FD 03 98 48 E8 97
C398:CA F0 2C AC FD 03 C8 AD 4D
C3A0:34 03 18 69 05 8D 34 03 66
C3A8:AD 35 03 69 00 8D 35 03 EE
C3B0:88 F0 E5 AD 34 03 18 69 97
C3B8:05 8D 34 03 AD 35 03 69 8E
C3C0:00 8D 35 03 4C B0 C3 68 97
C3C8:4C 78 C3 20 DD BD A0 FF 36
C3D0:C8 B9 00 01 D0 FA C8 98 D7
C3D8:48 A9 00 85 22 A9 01 85 86
C3E0:23 68 20 24 AB 60 A9 01 8D
C3E8:8D 36 03 AD C3 02 18 65 BB
C3F0:2F 8D 34 03 AD C4 02 65 14
C3F8:30 8D 35 03 AD 36 03 20 3F
C400:78 C3 AD 36 03 20 3C BC 9D
C408:AE 34 03 AC 35 03 20 D4 EB
C410:BB EE 36 03 AD AC 02 CD 1C
C418:36 03 B0 CF A9 01 8D 36 33
C420:03 AC AC 02 C8 98 38 ED 13
C428:36 03 20 3C BC A2 CD A0 02
C430:02 20 D4 BB A9 01 20 3C E6
C438:BC 20 97 E0 A9 CD A0 02 F0
C440:20 28 BA 20 CC BC A2 CD A9
C448:A0 02 20 D4 BB AD 36 03 F7
C450:20 3C BC A9 CD A0 02 20 40
C458:67 B8 20 A1 B7 8E 38 03 4D
C460:AD C3 02 18 65 2F 8D 34 AA
C468:03 AD C4 02 65 30 8D 35 D3
C470:03 AD 36 03 20 78 C3 AD F5
C478:34 03 8D CD 02 AC 35 03 9B
C480:8C CE 02 20 8C BA AD C3 B4
C488:02 18 65 2F 8D 34 03 AD A9
C490:C4 02 65 30 8D 35 03 AD A1
C498:38 03 20 78 C3 AD 34 03 CA
C4A0:AC 35 03 20 A2 BB AE CD 5F
C4A8:02 AC CE 02 20 D4 BB 20 44
C4B0:FC BB AE 34 03 AC 35 03 F8
C4B8:20 D4 BB EE 36 03 AD AC B3
C4C0:02 CD 36 03 90 03 4C 21 FF
C4C8:C4 A9 01 8D C6 02 AD C3 75
C4D0:02 18 65 2F 8D 34 03 AD F1
C4D8:C4 02 65 30 8D 35 03 AD E9
C4E0:C6 02 20 78 C3 AD 34 03 1A
C4E8:AC 35 03 20 A2 BB 20 A1 5E
C4F0:B7 8A 8D BB 02 20 4F C2 58
C4F8:AD C1 02 18 65 2F 8D 34 C2
C500:03 AD C2 02 65 30 8D 35 2D
C508:03 A0 00 AE BB 02 AD A9 13
C510:02 20 92 C3 AD 34 03 AC 24
C518:35 03 20 A2 BB 20 A1 B7 86
C520:E0 00 D0 03 4C EE C5 A9 B9
C528:01 8D 36 03 AD C1 02 18 1F
C530:65 2F 8D 34 03 AD C2 02 85
C538:65 30 8D 35 03 AD A9 02 AB
C540:A0 00 AE BB 02 20 92 C3 27
C548:AD 34 03 AC 35 03 20 A2 7B
C550:BB AD C1 02 18 65 2F 8D BF
C558:34 03 AD C2 02 65 30 8D 34
C560:35 03 AD A9 02 AC 36 03 C9
C568:AE BB 02 20 92 C3 AD 34 AF
C570:03 AC 35 03 20 0F BB AD E1
C578:AD 02 18 65 2D 8D 34 03 BF
C580:AD AE 02 65 2E 8D 35 03 3A
C588:AD 34 03 AC 35 03 20 28 41
C590:BA A2 CD A0 02 20 D4 BB DB
C598:AD 34 03 AC 35 03 20 A2 CB
C5A0:BB AD BF 02 18 65 2F 8D CF
C5A8:34 03 AD C0 02 65 30 8D 64
C5B0:35 03 AD AA 02 AC C5 02 48
C5B8:AE 36 03 20 92 C3 AD 34 BE
C5C0:03 AC 35 03 20 28 BA A9 90
C5C8:CD A0 02 20 50 B8 AD 34 9A
C5D0:03 AC 35 03 20 67 B8 AE 9E
C5D8:34 03 AC 35 03 20 D4 BB 26
C5E0:EE 36 03 AD A9 02 CD 36 D3
C5E8:03 90 03 4C 2C C5 EE C6 5C
C5F0:02 AD AC 02 CD C6 02 90 BC
C5F8:03 4C CE C4 60 20 FD AE 6D
C600:20 8A AD 20 AA B1 8D C8 F7
C608:02 8C C7 02 C0 00 D0 04 7E
C610:C9 00 F0 17 20 E6 C3 20 56
C618:E1 FF F0 10 CE C7 02 D0 20
C620:F3 AD C8 02 F0 05 CE C8 4E
C628:02 D0 E9 60 A0 00 4C 38 04
C630:A8 20 FD AE 20 9E B7 8E 3E
C638:BB 02 E0 00 F0 08 AD AC EF
C640:02 CD BB 02 B0 03 4C 48 4C
C648:B2 20 FD AE 20 9E AD 20 D8
C650:8F AD 20 A6 B6 CD A9 02 C1
C658:D0 EC 8E CD 02 8C CE 02 1A
C660:A9 00 8D 36 03 8D 38 03 99
C668:AC 36 03 AD CD 02 85 22 B8
C670:AD CE 02 85 23 B1 22 C9 0F
C678:31 F0 04 A9 00 F0 05 EE B2
C680:38 03 A9 01 20 3C BC AD 49
C688:C1 02 18 65 2F 8D 34 03 EB
C690:AD C2 02 65 30 8D 35 03 61
C698:AD A9 02 AC 36 03 C8 AE 70
C6A0:BB 02 20 92 C3 AE 34 03 FD
C6A8:AC 35 03 20 D4 BB EE 36 E5
C6B0:03 AD A9 02 CD 36 03 D0 9E
C6B8:AF AD 38 03 20 3C BC AD D9
C6C0:C1 02 18 65 2F 8D 34 03 24
C6C8:AD C2 02 65 30 8D 35 03 99
C6D0:AD A9 02 A0 00 AE BB 02 1E
C6D8:20 92 C3 AE 34 03 AC 35 BA
C6E0:03 20 D4 BB 60 4C 48 B2 C5
C6E8:20 15 C9 20 FD AE 20 9E 90
C6F0:AD 20 8F AD 20 A6 B6 8D C0
C6F8:36 03 A0 00 B1 22 99 DD 9D
C700:02 C8 CC 36 03 F0 04 C0 64
C708:14 D0 F1 A9 2C 99 DD 02 34
C710:C8 A9 57 99 DD 02 C8 98 14
C718:A2 DD A0 02 20 BD FF A9 46
C720:01 A2 08 A0 02 20 BA FF E9
C728:20 C0 FF A2 0F 20 C6 FF A8
C730:20 CF FF C9 30 F0 03 4C F7
C738:DA C7 20 CC FF A2 01 20 A4
C740:C9 FF AD A9 02 20 D2 FF 3B
C748:AD AA 02 20 D2 FF AD AC 3A
C750:02 20 D2 FF AE AD 02 AC 20
C758:AE 02 20 86 C7 AD BF 02 A2
C760:85 22 AD C0 02 85 23 AC 16
C768:AA 02 AE A9 02 20 9E C7 D3
C770:AD C1 02 85 22 AD C2 02 2F
C778:85 23 AC A9 02 AE AC 02 E9
C780:20 9E C7 4C 27 C9 8A 18 13
C788:65 2D 85 22 98 65 2E 85 25
C790:23 A0 00 B1 22 20 D2 FF 2C
C798:C8 C0 05 D0 F6 60 A5 2F 1E
C7A0:18 65 22 85 22 A5 30 65 9F
C7A8:23 85 23 C8 8C 36 03 8C EB
C7B0:CD 02 E8 8E 38 03 A0 00 BC
C7B8:A2 05 B1 22 20 D2 FF C8 48
C7C0:D0 02 E6 23 CA D0 F3 A2 6C
C7C8:05 CE 36 03 D0 EC AD CD E8
C7D0:02 8D 36 03 CE 38 03 D0 E9
C7D8:E1 60 20 D2 FF 20 CF FF C2
C7E0:C9 0D D0 F6 20 D2 FF 20 8E
C7E8:E7 FF 20 7A A6 4C 74 A4 0C
C7F0:20 15 C9 20 FD AE 20 9E 9A
C7F8:AD 20 8F AD 20 A6 B6 8D CA
C800:36 03 A0 00 B1 22 99 DD A8
C808:02 C8 CC 36 03 F0 04 C0 6E
C810:14 D0 F1 A9 2C 99 DD 02 3E
C818:C8 A9 52 99 DD 02 C8 98 7D
C820:A2 DD A0 02 20 BD FF A9 50
C828:01 A2 08 A0 02 20 BA FF F3
C830:20 C0 FF A2 0F 20 C6 FF B2
C838:20 CF FF C9 30 D0 9B 20 86
C840:CC FF A2 01 20 C6 FF 20 D8
C848:CF FF 8D A9 02 20 CF FF 3E
C850:8D AA 02 20 CF FF 8D AC DB
C858:02 20 E2 C8 AE AD 02 AC B8
C860:AE 02 20 8E C8 AD BF 02 35
C868:85 22 AD C0 02 85 23 AC 20
C870:AA 02 AE A9 02 20 A6 C8 EE
C878:AD C1 02 85 22 AD C2 02 39
C880:85 23 AC A9 02 AE AC 02 F3
C888:20 A6 C8 4C 27 C9 8A 18 3F
C890:65 2D 85 22 98 65 2E 85 2F
C898:23 A0 00 20 CF FF 91 22 A9
C8A0:C8 C0 05 D0 F6 60 A5 2F 28
C8A8:18 65 22 85 22 A5 30 65 A9
C8B0:23 85 23 C8 8C 36 03 8C F5
C8B8:CD 02 E8 8E 38 03 A0 00 C6
C8C0:A2 05 20 CF FF 91 22 C8 39
C8C8:D0 02 E6 23 CA D0 F3 A2 76
C8D0:05 CE 36 03 D0 EC AD CD F2
C8D8:02 8D 36 03 CE 38 03 D0 F3
C8E0:E1 60 A5 37 A4 38 85 33 E7
C8E8:84 34 A5 2D A4 2E 85 2F 69
C8F0:84 30 85 31 84 32 A5 7A 47
C8F8:8D A7 02 A5 7B 8D A8 02 3B
C900:A9 58 85 7A A9 C9 85 7B D1
C908:20 8B B0 8D AD 02 8C AE BA
C910:02 20 71 C0 60 A9 00 20 B0
C918:BD FF A9 0F A2 08 A0 0F 36
C920:20 BA FF 20 C0 FF 60 20 5B
C928:CC FF A9 01 20 C3 FF A9 21
C930:0F 20 C3 FF 60 4F 32 28 98
C938:50 32 29 2C 57 31 28 50 88
C940:32 2C 50 31 29 2C 49 4E EF
C948:28 50 31 2C 4E 50 29 2C 1F
C950:50 41 54 28 4E 50 29 00 6F
C958:52 41 00 50 31 00 50 32 C6
C960:00 4E 50 00 4F 32 28 30 55
C968:29 00 49 4E 28 30 2C 30 29
C970:29 00 57 31 28 30 2C 30 21
C978:29 00 50 41 54 28 30 29 8B
C980:00 00 00 00 00 00 81 00 17
C988:00 00 00 54 45 00 00 00 8B
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In *COMPUTE!'s Gazette* Programs," elsewhere in this issue.

Dipole

```
HR 10 REM COPYRIGHT 1990 COMPU
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      {SPACE}ALL RIGHTS RESERV
      ED
GP 20 PRINT"{CLR}{5}{N}":POKE5
      3280,0:POKE53281,11
MM 30 IF PEEK(49153)<>24 OR PE
      EK(49157)<>194 THEN LOAD
      "CL.ML",8,1
PC 40 X=RND(-33333)
PA 50 PRINT"INITIALIZING"
RR 60 SYS 49152,16,2,24,0.1
RQ 70 PRINT"LOADING PATTERNS"
KB 80 SYS 49167,1,"11000000000
      00000"
AA 90 SYS 49167,2,"01100000000
      00000"
PP 100 SYS 49167,3,"0011000000
       000000"
GK 110 SYS 49167,4,"0000110000
       000000"
EH 120 SYS 49167,5,"0000011000
       000000"
```

```
XE 130 SYS 49167,6,"0000001100
       000000"
QC 140 SYS 49167,7,"0000000011
       000000"
HA 150 SYS 49167,8,"0000000001
       100000"
MB 160 SYS 49167,9,"0000000000
       110000"
CF 170 SYS 49167,10,"000000000
       0001100"
SD 180 SYS 49167,11,"000000000
       0000110"
MB 190 SYS 49167,12,"000000000
       0000011"
ED 200 SYS 49167,13,"100010000
       0000000"
AB 210 SYS 49167,14,"010001000
       0000000"
QX 220 SYS 49167,15,"001000100
       0000000"
JR 230 SYS 49167,16,"000100010
       0000000"
EM 240 SYS 49167,17,"000010001
       0000000"
AJ 250 SYS 49167,18,"000001000
       1000000"
RG 260 SYS 49167,19,"000000100
       0100000"
KQ 270 SYS 49167,20,"000000010
       0010000"
FR 280 SYS 49167,21,"000000001
       0001000"
BP 290 SYS 49167,22,"000000000
       1000100"
SJ 300 SYS 49167,23,"000000000
       0100010"
PG 310 SYS 49167,24,"000000000
       0010001"
PA 320 PRINT"{CLR}"
FR 330 FOR I=1 TO 400
KF 340 SYS 49164,1
MC 350 T=0
AE 360 PRINT"{HOME}"
JJ 370 FOR J= 1 TO 16
XB 380 A=INT(W1(1,J)*1000000)
DG 390 T=T+A
SR 400 IF A < 10 THEN PRINT" "
       ;
DG 410 IF A < 100 THEN PRINT"
       {SPACE}";
HR 420 IF A < 1000 THEN PRINT"
       ";
MA 430 IF A < 10000 THEN PRINT
       " ";
KE 440 IF A < 100000 THEN PRIN
       T" ";
DF 450 PRINT A,
FD 460 NEXT J
FR 470 PRINT:PRINT T
MG 480 PRINT
HQ 490 T=0
XB 500 FOR J= 1 TO 16
CM 510 A=INT(W1(2,J)*1000000)
FR 520 T=T+A
GF 530 IF A < 10 THEN PRINT" "
       ;
EX 540 IF A < 100 THEN PRINT"
       {SPACE}";
RG 550 IF A < 1000 THEN PRINT"
       ";
BJ 560 IF A < 10000 THEN PRINT
       " ";
AX 570 IF A < 100000 THEN PRIN
       T" ";
QR 580 PRINT A,
SQ 590 NEXT J
AE 600 PRINT:PRINT T
DP 610 NEXT I
XQ 620 END
```

G

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1581 Partitioner

Jeremiah Farmer

Create and use subdirectories on your 1581 without resorting to cryptic DOS commands. For the 128 with an 80-column monitor.

The main advantage of the 1581 disk drive over Commodore's other drives is its increased storage capacity. The 1581 can store more than twice as much information per disk as can the 1571 and almost five times as much as the 1541. This extra storage space is great, but it poses a new problem. How do you organize the disk so that information can be found quickly and easily?

Most computers that have high-capacity disk drives organize data using a hierarchy of directories and subdirectories. Unfortunately, none of Commodore's equipment (including the 64, 128, 1541, 1571, and 1581) supports subdirectories. The 1581 overcomes this limitation by allowing you to divide disks into separate sections, called *partitions.*

The 1581's partitions are a cross between hierarchical directories and hard drive partitions. Like hard drive partitions, the 1581's partitions divide disks into sections. Each of these is treated as if it were another disk and must be formatted separately. But like hierarchical directories, the 1581's partitions can be nested.

The major obstacle in partitioning a 1581 disk is determining how to do this correctly. The 1581 user's manual contains a lengthy but confusing discussion on partitioning. To further complicate the matter, you must use several new DOS commands to create and access each partition.

1581 Partitioner takes the work out of partitioning a disk. It offers several ways to partition disks; it creates partitions by location, by size, or by number. It also deletes, accesses, displays directories of, and formats partitions.

Typing It In

1581 Partitioner is written entirely in BASIC. To prevent typing mistakes, type it in using *The Automatic Proofreader,* found elsewhere in this issue. Be sure to save a copy of the program to disk once you've finished entering it.

To begin using *1581 Partitioner,* load the program and type RUN. The program first displays the main screen and then requests that you enter the device number of the 1581 disk drive. Type the device number and press RETURN, or simply press RETURN to accept the default value of 8. Next, *1581 Partitioner* displays a directory of the partitions on the current disk and then shows the main menu.

```
F1   CREATE A PARTITION
F2   ACCESS A PARTITION
F3   RETURN TO THE ROOT
F4   DELETE A PARTITION
F5   FORMAT A DISK OR
     CURRENT PARTITION
F6   CHANGE DRIVE NUMBER
F7   VIEW DIRECTORY
ESC  EXIT PROGRAM
```

Each menu option is described below.

Creating Partitions

Before you attempt to partition a disk, you should be sure that the disk is formatted (you can use the Format a Disk or Current Partition option). If you're not sure whether the disk is already formatted, you can use the View Directory option to check. You should also be aware that partitioning a disk can destroy files that are already stored on the disk, so copy important files to another disk before you begin.

When you select the Create a Partition option, the program displays a submenu containing three options for partitioning a disk: by number of partitions per disk, by size of the partition, or by location of the partition. A fourth option allows you to return to the main menu without altering the disk.

If you want to divide the disk into a certain number of partitions, select the first option. The program prompts you for the number of partitions to create. Enter an even number from the range 2–20. Next, the program asks if you want to save a copy of the program on the disk. Answer *Y* or *N*. The program then prompts you for the name of each partition. Enter a unique name for each and press RETURN. After you've answered all the prompts, the program creates and formats the partitions.

To create a partition based on a certain size, choose the second submenu option. The program prompts you for the partition's size in blocks. Simply enter this within the following constraints: The partition must contain at least 120 blocks (or sectors), its size must be an even multiple of 40, and it must be small enough that it doesn't encompass track 40. This final constraint limits partitions to a maximum of 1560 blocks. After you've entered the size, type a name for the partition and press RETURN. As with the first option, the program prompts you to save a

copy of *1581 Partitioner* on the disk. Answer the prompts as before.

The last option, creating a partition by its location, is intended for more advanced users. This option is useful for creating a partition within a partition or one around a certain portion of the disk. If the disk already contains one or more partitions, this is the only partitioning option that will work correctly.

A 1581 disk has 80 tracks, numbered 1–80, and each track contains forty 256-byte sectors, numbered 0–39. A partition must start on sector 0 of the specified track, and it must end on sector 39 of the ending track. As mentioned above, a partition may contain a minimum of 120 blocks and a maximum of 1560 blocks. Remember, a partition cannot contain track 40; *1581 Partitioner* doesn't check for errors, so be careful.

Moving About

To access a partition, press F2 from the main menu. When the program prompts you for the name of the partition, simply type a name and then press RETURN. Once you access a partition, *1581 Partitioner* displays any partitions within the current partition. It also displays the beginning track, ending track, and number of blocks within the partition. If there are partitions within the current partition—that is, if they are nested—you can press F2 again to move into these.

The 1581's disk operating system doesn't provide a way to step back out of partitions one at a time. The only way to leave a partition is to go directly back to the root of the disk. You can move to the root directory by pressing F3 at the main menu.

Other Options

If you decide to delete a partition, select F4 from the main menu. When the program prompts you for the name of the ill-fated partition, enter it and press RETURN. If you change your mind, you can press F8 to abort the delete. Deleting a partition also deletes any files stored in it, including other partitions which may also contain files, so be careful when using this option.

Press F5 at the main menu to format a disk or the current partition. If you're currently in the root directory of the disk, this option formats the whole disk. If you're within a partition on the disk, it formats only that partition. When you select this option, the program prompts you for the name of the disk or partition to be formatted. Enter a name containing up to 16 characters and press RETURN.

To partition another disk, place the new disk into the drive and select the Change Drive Number option from the main menu. The program displays the current drive number and prompts you for the new drive number. If you want to use the same drive as before, simply press RETURN. To change to a different drive, enter the device number of the new drive. *1581 Partitioner* displays the directory of the new disk and returns to the main menu.

The standard directory listing shown by *1581 Partitioner* displays only the partitions contained in the current directory. If you need to examine other files within the directory, press F7 at the main menu. The program displays the files in the window on the left side of the screen. Pressing NO SCROLL or CONTROL-S pauses the listing; pressing the Commodore key slows the scrolling rate.

In Your Own Programs

When you've finished with *1581 Partitioner*, press ESC to exit. The program leaves the disk drive in the current partition so that you can access it from BASIC.

If you want to move between partitions from your own programs, you can do so with the following commands. To access a subdirectory, use the commands

```
OPEN 15,device number,15,"/0:partition
  name"
CLOSE 15
```

If the disk drive successfully accesses the partition, the reserved variable DS should contain the value 2. Be sure to check the error channel before executing the CLOSE 15 command.

To return to the root directory, use the command

```
OPEN 15,device number,15,"/"
CLOSE 15
```

As before, DS should contain a 2 if the command is successful.

1581 Partitioner

```
HQ 10 REM COPYRIGHT 1990 COMPU
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SP 20 COLOR0,1:COLOR4,1:COLOR6
      ,1:COLOR5,4:IFPEEK(215)=
      0THENPRINT"{CLR}SWITCH T
      O 80-COLUMN MODE AND PRE
      SS A KEY":POKE208,0:WAIT
      208,1:POKE208,0:GRAPHIC5
BG 30 DIMPN$(21):WINDOW0,0,79,
      24,1:KEY1,"1":KEY2,"2":K
      EY3,"3":KEY4,"4":KEY5,"5
      ":KEY6,"6":KEY7,"7":KEY8
      ,"ABORT"+CHR$(13):FAST:T
      RAP1040
PC 40 PRINTCHR$(142)CHR$(12)"
      {4 RIGHT}PARTITIONS ON T
      HIS DISK{4 RIGHT}B";
XQ 50 PRINT"{7 RIGHT}{A}CCCCCC
      CCCCCCCCCCCCCCCCCCCCCCCC
      CCCCCCCC{S}"
HC 60 PRINT"CCCCCCCCCCCCCCCCCC
      CCCCCCCCCCCCC{W}
      {7 RIGHT}B"TAB(78)"B"
JF 70 FORI=1TO15:PRINTTAB(31)"
      B{7 RIGHT}B"TAB(78)"B":N
      EXTI
QD 80 PRINTTAB(31)"B{7 RIGHT}
      {Z}CCCCCCCCCCCCCCCCCCCC
      CCCCCCCCCCCCCCCCC{X}"
FE 90 PRINTTAB(31)"B"TAB(51)"U
      CCCCCCCCCCCCCCCCI"
EX 100 PRINT"CCCCCCCCCCCCCCCCCC
      CCCCCCCCCCCCC{W}"TAB(5
      1)"B1581{RIGHT}{A}I
      {9 RIGHT}B"
MP 110 PRINT"{31 SPACES}B"TAB(
      51)"B{5 RIGHT}{Q}K
      {9 RIGHT}B"
DP 120 PRINT"CCCCCCCCCC{R}CCC
      CCCCCCC{R}CCCCCCCC{W}"T
      AB(51)"B{5 RIGHT}BARTIT
      IONERB"
DM 130 PRINT"FIRST TRACKBLAST
      {SPACE}TRACKB BLOCKS B"
      TAB(51)"JCCCCCCCCCCCCCC
      CCK"
SR 140 PRINT"CCCCCCCCCCC+CCCCC
      CCCCC+CCCCCCCC{W}"TAB(4
      6)"(C) 1990 COMPUTE!'S
      {SPACE}GAZETTE"
EE 150 PRINT"{11 RIGHT}B
      {10 RIGHT}B{8 RIGHT}B
      {HOME}":DV=8:GOSUB980:G
      OSUB1070
PJ 160 GOSUB1080:WINDOW40,1,77
      ,16,1
JQ 170 PRINT"{4 RIGHT}{RVS}F1
      {OFF}{2 RIGHT}CREATE A
      {SPACE}PARTITION":PRINT
      "{DOWN}{4 RIGHT}{RVS}F2
      {OFF}{2 RIGHT}ACCESS A
      {SPACE}PARTITION"
HF 180 PRINT"{DOWN}{4 RIGHT}
      {RVS}F3{OFF}{2 RIGHT}RE
      TURN TO THE ROOT DIRECT
      ORY"
SM 190 PRINT"{DOWN}{4 RIGHT}
      {RVS}F4{OFF}{2 RIGHT}DE
      LETE A PARTITION"
HX 200 PRINT"{DOWN}{4 RIGHT}
      {RVS}F5{OFF}{2 RIGHT}FO
      RMAT A DISK /":PRINT"
      {8 RIGHT}CURRENT PARTIT
      ION"
HP 210 PRINT"{DOWN}{4 RIGHT}
      {RVS}F6{OFF}{2 RIGHT}CH
      ANGE DRIVE NUMBER":PRIN
      T"{DOWN}{4 RIGHT}{RVS}F
      7{OFF}{2 RIGHT}VIEW DIR
      ECTORY"
FH 220 PRINT"{DOWN}{4 RIGHT}
      {RVS}ESC{OFF}{2 RIGHT}E
      XIT PROGRAM{HOME}"
GA 230 GETKEYA$:IFA$=CHR$(27)T
      HEN1040
RD 240 A=VAL(A$):IFA<1ORA>7THE
      N230
HA 250 ONAGOSUB260,880,910,920
      ,940,980,1020:GOTO160
RK 260 IFBL<120THENPRINT"{CLR}
      {8 DOWN}"TAB(9)"NO ROOM
       FOR A PARTITION{DOWN}"
      :PRINTTAB(15)"{RVS}PRES
      S A KEY":GETKEYA$:RETUR
      N
GP 270 PRINT"{CLR}{DOWN}DO YOU
       WISH TO CREATE A PARTI
      TION ON":PRINT"THE BASI
      S OF:"
FG 280 PRINT"{DOWN}{RIGHT}
      {RVS}F1{OFF}{2 RIGHT}TH
      E NUMBER OF PARTITIONS
      {SPACE}PER DISK"
MB 290 PRINT"{DOWN}{RIGHT}
      {RVS}F3{OFF}{2 RIGHT}TH
      E SIZE OF THE PARTITION
      "
CQ 300 PRINT"{DOWN}{RIGHT}
      {RVS}F5{OFF}{2 RIGHT}TH
```

```
      E LOCATION OF THE PARTI
      TION"
EE 310 PRINT"{DOWN}{RIGHT}
      {RVS}F7{OFF}{2 RIGHT}RE
      TURN TO MAIN MENU"
SR 320 GETKEYA$:A=VAL(A$):IFA<
      1ORA>7THEN320
AM 330 ONAGOSUB340,320,560,320
      ,720,320:RETURN
JP 340 PRINT"{CLR}{2 DOWN}THIS
       OPTION WILL CREATE A N
      UMBER OF":PRINT"EQUAL P
      ARTITIONS, USED AS 'MAN
      Y DISKS":PRINT"IN ONE'"
MD 350 PRINT"HOW MANY PARTITIO
      NS WOULD YOU LIKE TO":P
      RINT"CREATE? (FROM 2 TO
       20, USE EVEN ":PRINT"
      {2 DOWN}{2 RIGHT}OR PRE
      SS {RVS}F8{OFF} TO ABOR
      T...{3 UP}"
AJ 360 NP=0:NP$="":INPUT"NUMBE
      RS ONLY, PLEASE)";NP$:I
      FNP$="ABORT"THENRETURN
MA 370 NP=VAL(NP$):IF(NP/2)<>I
      NT(NP/2)ORNP<2ORNP>20TH
      EN340
BC 380 PRINT"{CLR}{4 DOWN}WOUL
      D YOU LIKE TO SAVE A CO
      PY OF"
EM 390 PRINT"THIS PROGRAM ON T
      HE DISK (Y/N) ?"
CG 400 SP$="":GETKEYSP$:IFSP$<
      >"N"ANDSP$<>"Y"THEN400
CX 410 SCNCLR:FORI=1TONP:PRINT
      "WHAT WILL PARTITION #"
      I
QK 420 PN$(I)="":PRINT"BE CALL
      ED "I"{4 LEFT}";:INPUTP
      N$(I):IFPN$(I)=""ORLEN(
      PN$(I))>16THENPRINT"
      {2 UP}":GOTO420
PM 430 NEXTI:PRINT"{CLR}
      {4 DOWN}{2 RIGHT}PRESS
      {SPACE}{RVS}RETURN{OFF}
       TO CONTINUE,":PRINT"
      {2 RIGHT}OR {RVS}F8
      {OFF} TO ABORT...":GETK
      EYA$:IFA$<>CHR$(13)THEN
      RETURN
KP 440 PRINT"{CLR}{7 DOWN}
      {2 RIGHT}CREATING PARTI
      TIONS...":S=INT(1580/(N
      P/2)):S=40*INT(S/40):IF
      NP=4ORNP=6THENS=S-40:GO
      TO460
QF 450 IFNP=2ANDSP$="Y"THENS=S
      -40
KS 460 X=INT(S/256):Y=S-(X*256
      ):TT=1:T=S/40:I=1:B=0
XJ 470 WINDOW40,1,77,16,1:PRIN
      TI;:P$=PN$(I):PRINT#15,
      "/0:"P$","+CHR$(TT)+CHR
      $(0)+CHR$(Y)+CHR$(X)+",
      C":IFDS<>0THENGOSUB1070
      :PRINT#15,"/":GOSUB1090
      :RETURN
XP 480 TT=TT+T:I=I+1:IFB=0AND(
      TT*40)+S>=1560THENTT=41
      :B=B+1
DQ 490 IFPN$(I)<>""THEN470
RC 500 WINDOW40,1,77,16,1:PRIN
      T"{7 DOWN}{2 RIGHT}FORM
      ATTING PARTITIONS..."
XX 510 FORI=1TONP:WINDOW70,8,7
      5,8,1:PRINTI;:PRINT#15,
      "/0:"+PN$(I):IFDS<>2THE
      NGOSUB1070:PRINT#15,"/"
      :GOSUB1090:RETURN
PP 520 PRINT#15,"N0:"+(PN$(I))
      +","+CHR$(INT(RND(1)*25
      )+65)+CHR$(INT(RND(1)*2
      5)+65):IFDS<>0THENGOSUB
      1070:PRINT#15,"/":GOSUB
      1090:RETURN
BG 530 PRINT#15,"/":IFDS<>2THE
      NGOSUB1070:PRINT#15,"I0
      "CHR$(13)"/":GOSUB1090:
      RETURN
GS 540 GOSUB1090:NEXTI:IFSP$="
      Y"THENDSAVE"1581 PARTIT
      IONER",U(DV)
FE 550 GOSUB1070:RETURN
BQ 560 PRINT"{CLR}{2 DOWN}THIS
       OPTION WILL CREATE ONE
       PARTITION":PRINT"OF A
      {SPACE}SPECIFIC SIZE, U
      SEFUL FOR A WORK":PRINT
      "AREA OR A BOOT SECTOR
      {DOWN}"
KA 570 PRINT"APPROXIMATELY HOW
       MANY BLOCKS WILL THE":
      PRINT"PARTITION BE? (MU
      LTIPLE OF 40 BETWEEN"
BP 580 PRINT"{2 DOWN}{2 RIGHT}
      OR PRESS {RVS}F8{OFF} T
      O ABORT...{3 UP}":LB=BL
      :IFLB>1560THENLB=1560
PD 590 PS=0:PS$="":PRINT"120 A
      ND"LB" BLOCKS PLEASE)";
      :INPUTPS$:IFPS$="ABORT"
      THENRETURN
PF 600 PS=VAL(PS$):IFPS<120ORP
      S>LBOR((PS/40)<>INT(PS/
      40))THEN560
BR 610 PRINT"{CLR}{2 DOWN}WOUL
      D YOU LIKE TO SAVE A CO
      PY OF":PRINT"THIS PROGR
      AM ON THE DISK (Y/N) ?"
      ;
EE 620 SP$="":GETKEYSP$:IFSP$<
      >"Y"ANDSP$<>"N"THEN620
DK 630 PRINT"{CLR}{2 DOWN}WHAT
       WILL THE PARTITION BE
      {SPACE}CALLED?":N$="":I
      NPUTN$:IFN$=""ORLEN(N$)
      >16THEN630
DC 640 PRINT"{CLR}{4 DOWN}
      {2 RIGHT}PRESS {RVS}RET
      URN{OFF} TO CONTINUE,":
      PRINT"{2 RIGHT}OR {RVS}
      F8{OFF} TO ABORT...":GE
      TKEYA$:IFA$<>CHR$(13)TH
      ENRETURN
EP 650 PRINT"{CLR}{7 DOWN}
      {2 RIGHT}CREATING PARTI
      TION...":FT=1:PS=40*(IN
      T(PS/40)):X=INT(PS/256)
      :Y=PS-(X*256)
SQ 660 PRINT#15,"/0:"N$","+CHR
      $(FT)+CHR$(0)+CHR$(Y)+C
      HR$(X)+",C":IFDS<>0THEN
      GOSUB1070:PRINT#15,"/":
      GOSUB1090:RETURN
PF 670 PRINT#15,"/0:"N$:IFDS<>
      2THENGOSUB1070:PRINT#15
      ,"/":GOSUB1090:RETURN
MK 680 GOSUB1090:WINDOW40,1,77
      ,16,1:PRINT"{7 DOWN}
      {2 RIGHT}FORMATTING PAR
      TITION..."
SS 690 PRINT#15,"N0:"N$","+CHR
      $(INT(RND(1)*25)+65)+CH
      R$(INT(RND(1)*25)+65):I
      FDS<>0THENGOSUB1070:PRI
      NT#15,"/":GOSUB1090:RET
      URN
EG 700 IFSP$="Y"THENDSAVE"1581
       PARTITIONER",U(DV)
MD 710 GOSUB1070:RETURN
FR 720 PRINT"{CLR}{2 DOWN}THIS
       OPTION WILL CREATE A P
      ARTITION":PRINT"AT A CE
      RTAIN LOCATION AND A CE
      RTAIN":PRINT"SIZE, USEF
      UL FOR PROTECTING A"
BG 730 PRINT"PARTICULAR PORTIO
      N OF THE DISK":PRINT"
      {3 DOWN}{2 RIGHT}OR PRE
      SS {RVS}F8{OFF} TO ABOR
      T...{4 UP}"
XR 740 PRINT"WHAT WILL THE PAR
      TITION BE CALLED?":N$="
      ":INPUTN$:IFN$=""ORN$="
      ABORT"THENRETURN
RD 750 IFLEN(N$)>16THEN740
HG 760 FT=0:TF$=RIGHT$("00"+ST
      R$(TF+1),3):PRINT"{CLR}
      {2 DOWN}WHAT IS THE STA
      RTING TRACK{2 SPACES}"T
      F$"{4 LEFT}";:INPUTFT:I
      FFT=40ORFT<TF ORFT>TLTH
      EN760
SC 770 SS=0:LB=BL:IFLB>1560THE
      NLB=1560
PE 780 PRINT"{DOWN}HOW MANY SE
      CTORS IS IT (MULTIPLE O
      F 40":PRINT"BETWEEN 120
       AND"LB")";:INPUTSC:IFS
      C<120ORSC>LBOR((SC/40)<
      >INT(SC/40))THEN770
BE 790 PRINT"{CLR}{4 DOWN}
      {2 RIGHT}PRESS {RVS}RET
      URN{OFF} TO CONTINUE,":
      PRINT"{2 RIGHT}OR {RVS}
      F8{OFF} TO ABORT...":GE
      TKEYA$:IFA$<>CHR$(13)TH
      ENRETURN
EJ 800 X=INT(SC/256):Y=SC-(X*2
      56):PRINT"{CLR}{7 DOWN}
      {2 RIGHT}CREATING PARTI
      TION..."
HE 810 PRINT#15,"/0:"N$","+CHR
      $(FT)+CHR$(SS)+CHR$(Y)+
      CHR$(X)+",C":IFDS<>0THE
      NGOSUB1070:PRINT#15,"/"
      :GOSUB1090:RETURN
CF 820 PRINT"{CLR}{2 DOWN}WOUL
      D YOU LIKE TO FORMAT TH
      E NEW":PRINT"PARTITION
      {SPACE}(Y/N) ?";
XS 830 GETKEYA$:IFA$<>"Y"ANDA$
      <>"N"THEN830
CR 840 PRINTA$:IFA$="Y"THENBEG
      IN:PRINT"{CLR}{7 DOWN}
      {2 RIGHT}FORMATTING PAR
      TITION..."
FK 850 PRINT#15,"/0:"N$:IFDS<>
      2THENGOSUB1070:PRINT#15
      ,"/":GOSUB1090:RETURN
QB 860 GOSUB1090:PRINT#15,"N0:
      "N$","+CHR$(INT(RND(1)*
      25)+65)+CHR$(INT(RND(1)
      *25)+65):IFDS<>0THENGOS
      UB1070:PRINT#15,"/":GOS
      UB1090:RETURN
AR 870 BEND:GOSUB1070:RETURN
EH 880 PRINT "{CLR}{6 DOWN}ENT
      ER NAME OF PARTITION TO
       ACCESS,":PRINT"OR PRES
      S {RVS}F8{OFF} TO ABORT
      ...":NAME$="":INPUTNAME
      $:IFNAME$=""ORNAME$="AB
      ORT"THENRETURN
GD 890 PRINT#15,"/0:"+NAME$:IF
      DS<>2THENGOSUB1070:PRIN
      T#15,"/":GOSUB1090:RETU
      RN
MK 900 GOSUB1070:GOSUB1090:RET
      URN
HM 910 PRINT#15,"/":GOSUB1090:
      GOSUB1070:RETURN
BK 920 PRINT"{CLR}{6 DOWN}ENTE
      R NAME OF PARTITION TO
      {SPACE}ERASE,":PRINT"OR
       PRESS {RVS}F8{OFF} TO
      {SPACE}ABORT...":Z$="":
      INPUTZ$:IFZ$="ABORT"ORZ
      $=""THENRETURN
```

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1581 Partitioner

```
GC 930 SCRATCH(Z$),U(DV):GOSUB
       1070:RETURN
CK 940 PRINT"{CLR}{5 DOWN}ENTE
       R NEW NAME OF DISK OR":
       PRINT"CURRENT PARTITION
        TO BE FORMATTED,":PRIN
       T"OR PRESS {RVS}F8{OFF}
        TO ABORT..."
AR 950 PRINT"{2 DOWN}{RIGHT}
       {RVS}WARNING{OFF}: FORM
       ATTING WILL DESTROY ANY
       ":PRINT"{RIGHT}PARTITIO
       NS VISIBLE IN THE DIREC
       TORY!{4 UP}"
QF 960 D$="":INPUTD$:IFD$="ABO
       RT"ORD$=""THENRETURN
EA 970 PRINT#15,"N0:"+D$+","+C
       HR$(INT(RND(1)*25)+65)+
       CHR$(INT(RND(1)*25)+65)
       :INPUT#15,EN,EM$,EN,EN:
       PRINT#15,"/":GOSUB1090:
       RETURN
JM 980 WINDOW0,0,79,24:PRINT"
       {24 DOWN}{11 SPACES}
       {RIGHT}{10 SPACES}
       {RIGHT}{8 SPACES}{HOME}
       ":WINDOW40,1,77,16,1:PR
       INT"{6 DOWN}{10 RIGHT}I
       NSERT A 1581 DISK"
RK 990 PRINT"{9 RIGHT}IN DEVIC
       E NUMBER "DV:PRINT"
       {9 RIGHT}AND PRESS RETU
       RN...":INPUT"{2 UP}
       {25 RIGHT}";A$:DV=VAL(A
       $):IFDV<8ORDV>11THEN980
PJ 1000 CLOSE15:OPEN15,DV,15,"
        I0":PRINT#15,"M-R"CHR$
        (198)CHR$(229)CHR$(1):
        GET#15,A$:IFA$<>CHR$(2
        55)THENPRINT"{2 DOWN}"
        TAB(7)"THAT DRIVE IS N
        OT A 1581":SLEEP1:GOTO
        980
PS 1010 GOSUB910:RETURN
KF 1020 WINDOW0,0,79,3:PRINT"
        {6 SPACES}FILES ON THI
        S DISK{6 SPACES}":WIND
        OW1,2,30,18,1:DIRECTOR
        Y U(DV):WINDOW40,1,77,
        16,1:PRINT"{7 DOWN}
        {3 RIGHT}PRESS ANY KEY
         TO CONTINUE..."
CF 1030 GETKEYA$:GOSUB1070:WIN
        DOW0,0,79,3:PRINT"
        {4 SPACES}PARTITIONS O
        N THIS DISK{3 SPACES}"
        :RETURN
SJ 1040 CLOSE15:KEY1,"GRAPHIC"
        :KEY2,"DLOAD"+CHR$(34)
        :KEY3,"DIRECTORY"+CHR$
        (13)
CF 1050 KEY4,"SCNCLR"+CHR$(13)
        :KEY5,"DSAVE"+CHR$(34)
        :KEY6,"RUN"+CHR$(13)
HE 1060 KEY7,"LIST"+CHR$(13):K
        EY8,"MONITOR"+CHR$(13)
        :WINDOW0,0,79,24,1:END
AJ 1070 WINDOW1,20,30,20,1:PRI
        NTDS$;:RETURN
EP 1080 WINDOW1,2,30,18,1:DIRE
        CTORY"*=C",U(DV):RETUR
        N
CQ 1090 WINDOW0,0,79,24:PRINT"
        {24 DOWN}{11 SPACES}
        {RIGHT}{10 SPACES}
        {RIGHT}{8 SPACES}{UP}"
        :TF=VAL(MID$(DS$,24,2)
        ):TL=VAL(MID$(DS$,27,2
        )):BL=(TL-TF)*40
DK 1100 PRINTTAB(4)TFTAB(15)TL
        TAB(24)BL"{HOME}":RETU
        RN
```

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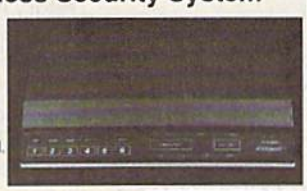

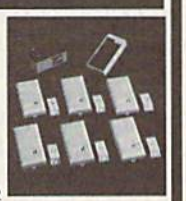

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Circle Reader Service Number 187

Screen Designer 128

James L. Lindly

Design impressive text and graphics screens on your 128 with this handy, easy-to-use program. A Commodore odd-series printer or compatible is optional.

The Commodore 128 has one of the best screen editors available on a personal computer. With it, you can use the 128's character graphics to create colorful, eye-catching screens. However, there are a couple of problems with generating screens this way. First, you have no way to save the screens after you've created them. And second, they're not easy to incorporate into your own programs.

Screen Designer 128 helps you create text screens for your BASIC programs. With *Screen Designer 128*, you can design up to five text screens using the 128's editing and graphics keys as if you were in direct mode. Thus, you have the freedom to move about the screen, changing colors and typing text and graphics characters as you go. When you've completed your screen, *Screen Designer 128* allows you to print it or save it for future use.

Getting Started

Screen Designer 128 is written entirely in BASIC. Enter the program from 128 mode using *The Automatic Proofreader*, found elsewhere in this issue. Be sure to save a copy of the program to disk when you've finished typing.

When you're ready to design a screen, load and run *Screen Designer 128*. You'll be presented with a menu of 11 options for creating, saving, loading, and printing up to five different screens. There are also menu options for such tasks as viewing a disk directory, scratching a file, formatting a disk, and generating the BASIC code that recreates one of the five screens.

Menu Options

The first option is Design a Screen. Select this option to create artwork, to write a memo to yourself, or just to doodle on an electronic scratch pad. *Screen Designer 128* asks you which screen you'd like to design. Type in a number from 1 to 5. The screen then clears, and you're put in design mode. Use the cursor and color control keys to move about and change text colors as you would in direct mode. Press F1 to increment the background color or F3 to decrement it.

When you've finished designing, press F5. This saves your screen in memory and returns you to the menu. If you want to leave design mode without storing the screen in memory, press the ESC key.

The second menu option is Save a Screen. It allows you to save one of the five screens to disk for future use. Enter the number of the screen you wish to save, or press the back-arrow key (←) to abort the save. After selecting the screen, type in a filename. This name must be 15 characters or less in length. *Screen Designer 128* saves two files: The first contains the screen information; the second contains color information. The second file has a C appended to its name.

The third option is Load a Screen. With this option, you can load a screen created previously with *Screen Designer 128*. Enter a screen number, then the name of the file. Note that, as the file loads, any information previously stored in this screen will be overwritten. As with the save option, the back arrow aborts the operation.

Next is the View a Screen option. Select this option to view any of the five screens in memory. Simply enter the number of the screen you wish to view and it will appear. Press any key when you've finished viewing the screen.

Option 5 is Edit a Screen. Select this option to modify one of the five screens in memory. Enter a screen number and the program will display that screen and put you in design mode.

Disk Options

The next three menu options are specific to the disk drive. Option 6, Disk Directory, displays onscreen a listing of the files on the disk. This is useful for finding previously saved screens without leaving *Screen Designer 128*. Press the NO SCROLL key to pause the directory listing. *Screen Designer 128* automatically pauses at the end of the listing. Press any key to resume.

The next two options are very powerful and should be used with caution. Option 7 scratches a file on disk. The deleted file can be any file—not necessarily one created with *Screen Designer 128*. Type in the name of the file that you wish to scratch and press RETURN (press the back-arrow key to abort the delete). If you're deleting a screen created with *Screen Designer 128*, remember to scratch the color file as well.

Choose option 8 to format a disk. *Screen Designer 128* waits for you to insert a disk and press RETURN. It then formats the disk and displays a directory listing. As always, you can press the back-arrow key to abort the operation.

Miscellaneous Options

The Generate Code option creates BASIC statements that recreate one of the screens. These statements are appended to the end of *Screen Designer 128*. When you choose this option, you're first asked for the starting line number for the generated code. Enter a

number greater than 2300 and less than 60000. *Screen Designer 128* then asks which screen to code. Enter a number from 1 to 5; then press any key to begin the coding process.

Screen Designer 128 displays the line numbers used to code each of the five screens when this option is selected. This is useful when you need to code more than one screen. To avoid overwriting a previously coded screen, be sure to enter a starting line number that doesn't conflict with a previously coded screen.

The Print Screen option prints one of the screens on a Commodore odd-series printer (a 1525, an MPS-801, an MPS-803, and so on). You're first asked if you want the screens printed in text mode (with the upper-/lowercase character set) or in graphics mode (with the uppercase/graphics character set). If you choose text mode, you're asked if the screen should be printed in 40 or 80 columns. If you choose 40, the text is automatically centered on the page; otherwise, it's printed normally.

The last menu option is Screen Color. Press F1 to increment the screen background color or F3 to decrement it.

Using the Screens

Screen Designer 128 is written so that the screens you create with it can be used in your BASIC programs without *Screen Designer 128*'s support. There are two ways to do this. The first way is to simply BLOAD a saved screen.

For example, let's say you have a screen stored on disk as PICTURE. The following BASIC statements load the picture and its color information:

```
BLOAD"PICTURE",B15,P1024
BLOAD"PICTUREC",B15,P55295
```

Note once again that the file holding the color information has a C appended to its name.

The other way is to have *Screen Designer 128* generate the BASIC code to recreate the screen. This places BASIC PRINT statements at the end of *Screen Designer 128*, as explained above. After coding your screens, exit *Screen Designer 128* by pressing RUN/STOP-RESTORE. Type DELETE 10–2300 to eliminate the lines of code specific to *Screen Designer 128* itself. The lines which remain can then be added to your own BASIC programs to generate each screen.

Screen Designer 128

```
HQ 10 REM COPYRIGHT 1990 COMPU
      TE! PUBLICATIONS, INC. -
        ALL RIGHTS RESERVED
EM 20 FAST:GRAPHIC1,0:GRAPHIC0
      :COLOR0,1:COLOR4,4:SC=1:
      DIMKC(16):SLOW
SA 30 PRINT"{CLR}{8 DOWN}{3}"T
      AB(12)"SCREEN DESIGNER"
XS 40 PRINTTAB(12)"{DOWN}{5}CO
      PYRIGHT 1990
KB 50 PRINTTAB(7)"{DOWN}{5}COM
      PUTE! PUBLICATIONS, INC.
      ":PRINTTAB(10)"{DOWN}{5}
      ALL RIGHTS RESERVED":SLE
      EP1
SE 55 JF$="":BANK1:JF=POINTER(
      JF$):LO=PEEK(JF+1):HI=PE
      EK(JF+2)
JC 56 Y=PEEK(JF):X=10:A=250:BA
      NK15:POKE250,LO:POKE251,
      HI:POKE252,1:SYS65381,A,
      X,Y:X=9:SYS65381,A,X,Y
DR 60 GOTO2200
JK 70 REM -- MAIN MENU --
MS 80 TRAP80:SLOW:COLOR0,1:PRI
      NT"{CLR}{2 HOME}";TAB(18
      )"{3}MENU"+CHR$(142):POK
      E208,0
BS 90 TT$="{DOWN}{9 RIGHT}{3}(
      ":PRINTTAB(18)"{4 Y}{UP}
      "
DF 100 PRINTTT$"1){CYN}
       {3 SPACES}DESIGN A SCRE
       EN"
SK 110 PRINTTT$"2){CYN}
       {3 SPACES}SAVE A SCREEN
       "
PH 120 PRINTTT$"3){CYN}
       {3 SPACES}LOAD A SCREEN
       "
PQ 130 PRINTTT$"4){CYN}
       {3 SPACES}VIEW A SCREEN
       "
BF 140 PRINTTT$"5){CYN}
       {3 SPACES}EDIT A SCREEN
       "
DD 150 PRINTTT$"6){CYN}
       {3 SPACES}DISK DIRECTOR
       Y"
RK 160 PRINTTT$"7){CYN}
       {3 SPACES}SCRATCH A FIL
       E"
SB 170 PRINTTT$"8){CYN}
       {3 SPACES}FORMAT A DISK
       "
FF 180 PRINTTT$"C){CYN}
       {3 SPACES}GENERATE CODE
       "
RE 190 PRINTTT$"P){CYN}
       {3 SPACES}PRINT A SCREE
       N"
HE 200 PRINT"{DOWN}{3}
       {5 SPACES}(F1/F3){CYN}
       {3 SPACES}SCREEN {PUR}C
       {YEL}O{GRN}L{7}O{RED}R"
CA 210 PRINT"{YEL}CCCCCCCCCCCC
       CCCCCCCCCCCCCCCCCCCCCCC
       CCCCC"
HE 220 PRINT"{RIGHT}{3}USE
       {CYN}<{3} OR {CYN}RUN/S
       TOP{3} TO {CYN}ESCAPE
       {3} A ROUTINE{HOME}":WI
       NDOW0,0,39,22
AK 230 GETA$:POKE208,0:IFA$="P
       "THEN1200
XS 240 IFPEEK(212)=5THENKU=-1:
       GOSUB960
QD 250 IFPEEK(212)=4THENKU=1:G
       OSUB960
FS 260 IFA$="C"THENLQ=LN:GOTO1
       890
FG 270 IFVAL(A$)<1 ORVAL(A$)>8
       THENPRINT"{2 UP}":GOTO2
       30
MM 280 ONVAL(A$)GOTO300,450,60
       0,750,750,920,1130,1010
PC 290 REM -- DESIGN A SCREEN
       {SPACE}--
BB 300 PRINT"{CLR}{3}{2 DOWN}E
       NTER WHICH SCREEN TO DE
       SIGN..."
PJ 310 PRINT"{CYN}1, 2, 3, 4,
       {SPACE}OR 5..."
HQ 320 GETKEYK$:IFK$="<"THEN80
FK 330 IFVAL(K$)<1ORVAL(K$)>5T
       HEN320
EH 340 RS=1:GOSUB800
QP 350 PRINT"{2 HOME}{CLR}
       {YEL}";:POKE248,255
FK 355 JX=PEEK(235):JY=PEEK(23
       6):CP=1024+JX*40+JY:POK
       ECP,(PEEK(CP)+128)AND25
       5
KJ 360 TRAP360:IFPEEK(208)>0TH
       ENGETJF$:GOTO400
BD 365 JF=PEEK(212):IFJF=88THE
       N365
GM 370 GETJF$:IFJF=72THENPOKE2
       48,0:GOTO80
XD 380 IFJF=4THENPOKE53281,(PE
       EK(53281)+1)AND15:GOTO3
       60
CF 390 IFJF=5THENPOKE53281,(PE
       EK(53281)-1)AND15:GOTO3
       60
HC 395 IFJF=6THENJX=PEEK(235):
       JY=PEEK(236):CP=1024+JX
       *40+JY:POKECP,(PEEK(CP)
       +128)AND255:GOTO410
DH 400 JX=PEEK(235):JY=PEEK(23
       6):CP=1024+JX*40+JY:POK
       ECP,(PEEK(CP)+128)AND25
       5:PRINTJF$;
FC 404 JX=PEEK(235):JY=PEEK(23
       6):CP=1024+JX*40+JY:POK
       ECP,(PEEK(CP)+128)AND25
       5:GOTO360
HD 410 POKE183,0:POKE184,4:POK
       E186,0:POKE187,216:POKE
       248,0:TRAP80
SH 420 POKE177,P(SM+1):POKE178
       ,P(SM+2):POKE179,P(SM+3
       ):POKE180,P(SM+4):SYS35
       84
DH 430 PRINT"{CLR}{2 HOME}
       {OFF}{3}{2 DOWN}SCREEN
       {SPACE}NOW IN MEMORY...
       ":SLEEP1:POKE248,0:CLOS
       E1:GOTO80
GK 440 REM -- SAVE A SCREEN --
QS 450 PRINT"{CLR}{3}"TAB(13)"
       SAVE A SCREEN"
DX 460 PRINTTAB(13)"{13 Y}"
XA 470 PRINT"{5 DOWN}";:F$=""
EP 480 PRINT"ENTER WHICH SCREE
       N TO SAVE...":PRINT"
       {CYN}1, 2, 3, 4, OR 5:
       {2 SPACES}{YEL}YOUR CHO
       ICE{RIGHT}--> ( )"
BA 490 GETKEYK$:IFK$="<"THEN80
GA 500 IFVAL(K$)<1ORVAL(K$)>5T
       HEN490
ER 510 SM=VAL(K$):PRINT"{HOME}
       {3}{8 DOWN}"TAB(36);K$
CG 520 PRINT"{CYN}{DOWN}ENTER
       {SPACE}A NAME FOR SCREE
       N #{3}"SM"{CYN}AND HIT"
       :PRINT"{RVS}RETURN{OFF}
       {3}";:INPUT F$:IFLEN(F$
       )>15ORF$=""THENPRINT"
       {3 UP}";:GOTO520
CG 530 IFF$="<"THEN80
CD 540 PRINT"{DOWN}SAVING ";F$
       "{2 SPACES}{CYN}( SCREE
       N #"SM"){DOWN}"
AC 550 OPEN15,8,15:BSAVE(F$),B
       0,P(SL(SM)) TO P(SL(SM)
       +1000)
QA 560 INPUT#15,A,A$,B$,C$:IFA
       <>0THENPRINTA$:CLOSE15:
       SLEEP1:GOTO450
AR 570 BSAVE(F$)+"C",B0,P(CL(S
       M))TOP(CL(SM)+1000)
```

```
HH 580 CLOSE15:PRINT"{2 DOWN}
       {3}SCREEN FILED ON DISK
       ...":SLEEP2:GOTO80
PX 590 REM - LOAD A SCREEN --
KD 600 PRINT"{CLR}{3}"TAB(13)"
       LOAD A SCREEN"
RG 610 PRINTTAB(13)"{13 Y}"
RK 620 PRINT"{5 DOWN}";:F$=""
EC 630 PRINT"ENTER WHICH SCREE
       N TO LOAD...":PRINT"
       {CYN}1, 2, 3, 4, OR 5:
       {2 SPACES}{YEL}YOUR CHO
       ICE{RIGHT}--> ( )"
XP 640 GETKEYK$:IFK$="<"THEN80
JE 650 IFVAL(K$)<1ORVAL(K$)>5T
       HEN640
SF 660 SM=VAL(K$):PRINT"{HOME}
       {3}{8 DOWN}"TAB(36);K$:
       IFPR=1THENPR=0:RETURN
PC 670 PRINT"{CYN}{DOWN}ENTER
       {SPACE}THE NAME OF YOUR
        SCREEN FILE":PRINT"AND
        HIT {RVS}RETURN{3}
       {OFF}";:INPUT F$:IFLEN(
       F$)>15ORF$=""THENPRINT"
       {3 UP}";:GOTO670
BQ 680 IFF$="<"THEN80
DD 690 PRINT"{DOWN}LOADING ";F
       $"{2 SPACES}{CYN}( SCRE
       EN #"SM")"
AJ 700 TRAP710:OPEN15,8,15:BLO
       AD(F$),B15,P(SL(SM)):GO
       TO720
XF 710 PRINT"{DOWN}"DS$:CLOSE1
       5:SLEEP1:GOTO600
EM 720 BLOAD(F$)+"C",B15,P(CL(
       SM))
JR 730 CLOSE15:PRINT"{2 DOWN}
       {3}SCREEN LOADED FROM D
       ISK...":SLEEP2:GOTO80
MS 740 REM -- DISPLAY A SCREEN
        --
DJ 750 PRINT"{CLR}";
JK 760 PRINT"{3 DOWN}{3}ENTER
       {SPACE}SCREEN TO DISPLA
       Y..."
RS 770 PRINT"{CYN}1, 2, 3, 4,
       {SPACE}OR 5..."
BC 780 GETKEYK$:IFK$="<"THEN80
KP 790 IFVAL(K$)<1ORVAL(K$)>5T
       HENPRINT"{UP}";:GOTO780
AA 800 SM=VAL(K$):IFSM=1THENSM
       =0
QD 810 SM=SM*2:IFSM=8THENSM=12
PG 820 IFSM=10THENSM=16
QR 830 IFSM=6THENSM=8
QH 840 IFRS=1THENRS=0:RETURN
JR 850 PRINT"{CLR}";:POKE183,P
       (SM+1):POKE184,P(SM+2):
       POKE186,P(SM+3):POKE187
       ,P(SM+4)
EA 860 POKE177,0:POKE178,4:POK
       E179,0:POKE180,216:BANK
       15:SYS3584
BE 870 IFA$="5"THENPOKE248,255
       :PRINT"{2 HOME}{YEL}";:
       GOTO355
MJ 880 GETA$:IFA$=""THEN880
RR 890 IFR2=1THENR2=0:RETURN
PS 900 GOTO80
MQ 910 REM -- DISK DIRECTORY -
       -
EA 920 PRINT"{CLR}{3}{DOWN}PRE
       SS THE {RVS}NO SCROLL
       {OFF} KEY TO PAUSE":SLE
       EP2
FX 930 PRINT"{CLR}{CYN}":DIREC
       TORY
QC 940 GOTO 880
PA 950 REM -- CHANGE SCREEN CO
       LOR --
QA 960 SC=SC+KU:IFSC>16THENSC=
       1
GS 970 IFSC<1THENSC=16
GR 980 COLOR0,SC:FORI=1TO100:N
       EXT
HP 990 PRINT"{HOME}";:RETURN
MX 1000 REM -- FORMAT A DISK -
        -
JR 1010 PRINT"{2 HOME}{CLR}{3}
        "TAB(13)"FORMAT A DISK
        "
BK 1020 PRINTTAB(13)"{13 Y}"
SJ 1030 PRINT"{2 DOWN}{CYN}INS
        ERT DISK AND HIT {RVS}
        {3}RETURN{OFF}"
XK 1040 PRINT"{HOME}{3}
        {24 DOWN}{12 RIGHT}USE
         < TO ESCAPE{HOME}":FO
        RT2=1TO200:NEXT
FP 1050 PRINT"{HOME}{3}
        {24 DOWN}{12 RIGHT}
        {15 SPACES}{HOME}":FOR
        T1=1TO100:NEXT
AR 1060 GETK$:IFK$="<"THEN80
MF 1070 IFK$<>CHR$(13)THEN1040
JK 1080 PRINT"{HOME}{24 DOWN}
        {12 RIGHT}{16 SPACES}
        {HOME}"
HH 1090 PRINT"{6 DOWN}{YEL}PLE
        ASE WAIT..."
SX 1100 HEADER"SCREEN FILES",I
        10
DA 1110 PRINT"{3}{2 DOWN}FORMA
        T COMPLETE":SLEEP2:GOT
        O920
HE 1120 REM -- SCRATCH A FILE
        {SPACE}--
EK 1130 PRINT"{CLR}{3}"TAB(13)
        "FILE SCRATCH"
AH 1140 PRINTTAB(13)"{12 Y}"
AK 1150 PRINT"{2 DOWN}{CYN}NAM
        E OF FILE TO SCRATCH
        {3}";:INPUTF$
BK 1160 IFLEN(F$)>15ORF$=""THE
        NPRINT"{3 UP}";:GOTO11
        50
QC 1170 IFF$="<"THEN80
EG 1180 SCRATCH(F$):SCRATCH(F$
        )+"C":PRINT"{2 DOWN}
        {3}"F$" FILE SCRATCHED
        ":SLEEP2:GOTO80
BR 1190 REM -- PRINT A SCREEN
        {SPACE}--
SK 1200 TRAP1440:PRINT"{CLR}
        {3}"TAB(13)"PRINT A SC
        REEN"
CJ 1210 PRINTTAB(13)"{14 Y}"
MG 1220 PRINT"{3}{2 DOWN}ENTER
         WHICH SCREEN TO PRINT
        ...":PRINT"{CYN}1, 2,
        {SPACE}3, 4, OR 5:
        {2 SPACES}{YEL}YOUR CH
        OICE{RIGHT}--> ( )"
KP 1230 GETKEYK$:IFK$="<"THEN8
        0
SE 1240 IFVAL(K$)<1ORVAL(K$)>5
        THEN1230
EP 1250 SM=VAL(K$):PRINT"
        {HOME}{3}{5 DOWN}"TAB(
        36);K$
JE 1260 PRINT"{3}{2 DOWN}{RVS}
        T{OFF}EXT MODE OR
        {RVS}G{OFF}RAPHIC MODE
        ?"
GM 1270 M2$="4":GETKEYM$:IFM$<
        >"G"ANDM$<>"T"THEN1270
BB 1280 IFM$="T"THENPRINT"
        {CYN}{RVS}4{OFF}0 OR
        {RVS}8{OFF}0 COLUMN?"
EX 1290 IFM$="T"THENGETKEYM2$:
        IFM2$<>"8"ANDM2$<>"4"T
        HEN1290
FA 1300 CL=VAL(M2$)*10
HR 1310 POKE6,4:POKE144,0:SYS6
        5457:DV=ST:SYS65454:DV
        =DVORST:IFDVTHEN2170
SE 1320 PRINT"{CLR}":FAST:TRAP
        1440:CLOSE4:OPEN4,4:A$
        =CHR$(15):B$=CHR$(8):P
        O$=CHR$(16):IFM$="T"TH
        ENB$=CHR$(15):PRINT#4,
        B$:CLOSE4:OPEN4,4,7
AG 1330 RO=0:TB=0:TD=0:FORI=SL
        (SM)TOSL(SM)+999:GETE$
        :IFE$="<"THEN1440
XC 1340 P=PEEK(I):IFP>128THENR
        O=1:P=P-128
EX 1350 IFP=34THENPRINT#4,"'";
        :GOTO1420
HM 1360 IFP<32ORP>95THENP=P+64
        :GOTO1390
HK 1370 IFP>63ANDP<96THENP=P+3
        2:GOTO1390
BK 1380 IFP>31ANDP<64THEN1390
FG 1390 P$=CHR$(P):IFRO=1THENR
        O=0:P$=CHR$(18)+CHR$(P
        )+CHR$(146)
RQ 1400 IFM$="G"ORCL=40THENPRI
        NT#4,A$;PO$"20";P$;B$;
        :GOTO1420
QB 1410 PRINT#4,A$;PO$"00";P$;
        B$;
XS 1420 TB=TB+1:IFTB=CLTHENPRI
        NT#4:TB=0
PP 1430 NEXT
GF 1440 PRINT#4:CLOSE4:SLOW
JG 1450 GOTO80
GC 1460 REM -- CODE A SCREEN -
        -
QS 1470 FAST:TRAP2120:PRINT"
        {2 HOME}{CLR}":D1=SL(S
        M):AV=39:LX(K)=LN:LN(K
        )=LN:K=K+1
SG 1480 PRINT"{CLR}{6 DOWN}":P
        L=1313:RV=0:PS=PL+27:A
        D=40:D2=D1+40:IFAV=104
        0THEN80
AK 1490 PRINTTAB(PX);LN"?"+CHR
        $(34):IFAV=39THENPRINT
        "{UP}";TAB(PX);LN;"?CH
        R$(27)+"CHR$(34);"M";C
        HR$(34);";";CHR$(34)+C
        HR$(147):PL=PL+14:AV=4
        0
GX 1500 P=PEEK(D1):CP=D1+1000:
        C=PEEK(CP):IFP=34THENP
        =39
BD 1510 IFC>16THENC=C-16:GOTO1
        510
HA 1520 IFP<129ANDRV=1THENGOTO
        1650
DS 1530 IFP>128THENP=P-128:GOT
        O1630
EB 1540 IFP=32ANDRV=0THEN1580
DG 1550 IFKC(C)=1THEN1580
HK 1560 IFC=0THEN1690
SA 1570 ONCGOTO1700,1710,1720,
        1730,1740,1750,1680,17
        60,1770,1780,1790,1810
        ,1820,1830,1840
BC 1580 POKEPL,P
PE 1590 GETK$:IFK$="<"THEN2120
PQ 1600 D1=D1+1:PL=PL+1:IFD1=D
        2THENPOKEPL,34:GOTO188
        0
FQ 1610 IFPL>PSTHENPOKEPL,34:P
        OKEPL+1,59:PL=1313+AD:
        AD=AD+40:LN=LN+2:PS=PL
        +27:GOTO1490
PH 1620 GOTO1500
GB 1630 IFRV=1THEN1540
KC 1640 RV=1:POKEPL,146:P=P+12
        8:PL=PL+1:GOTO1660
HC 1650 RV=0:POKEPL,210:PL=PL+
        1
```

```
FM 1660 IFPL>PSTHEN1610
RR 1670 GOTO1530
MF 1680 XX=222:GOTO1850
BK 1690 XX=208:GOTO1850
DE 1700 XX=133:GOTO1850
AJ 1710 XX=156:GOTO1850
EM 1720 XX=223:GOTO1850
PE 1730 XX=220:GOTO1850
PR 1740 XX=158:GOTO1850
DD 1750 XX=159:GOTO1850
XQ 1760 XX=193:GOTO1850
QX 1770 XX=213:GOTO1850
PS 1780 XX=214:GOTO1850
CQ 1790 XX=215:GOTO1850
FQ 1800 XX=216:GOTO1850
MQ 1810 XX=216:GOTO1850
AC 1820 XX=217:GOTO1850
KB 1830 XX=218:GOTO1850
HD 1840 XX=219
JM 1850 POKEPL,XX:FORI=0TO15:K
        C(I)=0:NEXT:KC(C)=1:PL
        =PL+1
JG 1860 IFPL>PSTHEN1610
JJ 1870 GOTO1530
BP 1880 PRINT"{HOME}{13 DOWN}G
        OTO1480";:D1=SL(SM)+AV
        :AV=AV+40:LN=LN+2:POKE
        208,7:FORI=842TO849:PO
        KEI,13:NEXT:PRINT"
        {HOME}{2 DOWN}":STOP
BQ 1890 PRINT"{CLR}{3}"TAB(13)
        "CODE A SCREEN"
KB 1900 PRINTTAB(13)"{13 Y}"
XE 1910 PRINT"{CYN}{DOWN}LINE
        {SPACE}#'S USED...
        {DOWN}":LX(K-1)=LN
CK 1920 FORI=1TO5:COLOR5,I+2:P
        RINTLN(I)"TO"LX(I):NEX
        T:IFK>5THENPRINT"
        {DOWN}{CYN}YOU HAVE RE
        ACHED FIVE SCREENS!":S
        LEEP2:GOTO80
BC 1930 PRINT"{DOWN}{CYN}ENTER
         STARTING LINE NUMBER.
        .."
HX 1940 PRINT"MUST BE {RVS}{3}
        LARGER{CYN}{OFF} THAN
        {SPACE}2999 AND {RVS}
        {3}SMALLER{CYN}{OFF}
        {4 SPACES}THAN 60000!
        {3}":LN=0
MK 1950 PX=0:Z$="":INPUT LN$:L
        N=VAL(LN$):IFLN$="<"TH
        EN80
BH 1960 IFLN<3000ORLN>59999THE
        N1890
BH 1970 IFLN<10000THENPX=1
CG 1980 PRINT"{5 UP}"+CHR$(27)
        +"@"
RF 1990 PRINT"{3}ENTER WHICH S
        CREEN TO CODE...
        {6 SPACES}":PRINT"
        {CYN}1, 2, 3, 4, OR 5:
        {2 SPACES}{YEL}YOUR CH
        OICE --> ( ) "
EP 2000 GETKEYK$:IFK$="<"THEN8
        0
FQ 2010 IFVAL(K$)<1ORVAL(K$)>5
        THEN2000
RP 2020 SM=VAL(K$):PRINT"
        {HOME}{3}{12 DOWN}"TAB
        (36);K$
EM 2030 PRINT"{2 DOWN}{YEL}WHE
        N READY, PRESS A KEY."
PQ 2040 PRINT"THE COMPUTER WIL
        L GO INTO {RVS}FAST
        {OFF} MODE..."
AX 2050 PRINT"THE SCREEN WILL
        {SPACE}BLANK."
QJ 2060 PRINT"IF DURING THE CO
        DING PROCESS YOU"
BF 2070 PRINT"DECIDE TO ABORT
        {SPACE}THEN PRESS {3}<
        "
BD 2080 PRINT"{YEL}AND THE COM
        PUTER WILL RETURN TO T
        HE"
CK 2090 PRINT"MAIN MENU.{HOME}
        "
MR 2100 GETKEYA$:IFA$="<"THENL
        N=LX(K-1):GOTO80
SK 2110 GOTO1470
QX 2120 K=K-1:LX(K)=LN
JJ 2130 PRINT"{CLR}":IFED=1THE
        NED=0:LN(K)=0:LX(K)=0:
        GOTO80
CM 2140 PRINT"{HOME}{7 DOWN}";
        :FORI=1TO6:PRINTLN(K):
        LN(K)=LN(K)+2:IFLN(K)+
        2>LX(K)THENED=1:GOTO21
        60
HK 2150 NEXT
AB 2160 PRINT"{HOME}{13 DOWN}G
        OTO2130";:POKE208,7:FO
        RI=842TO849:POKEI,13:N
        EXT:PRINT"{HOME}
        {2 DOWN}":STOP
SE 2170 PRINT"{2 HOME}{CLR}{3}
        {2 DOWN}{RVS}PRINTER I
        S NOT ONLINE...{OFF} C
        ORRECT AND HITANY KEY.
        {2 SPACES}{CYN}HIT {3}
        RUN/STOP {CYN}FOR MENU
        .":GETKEYD4$:GOTO80
SR 2180 REM -- GET READY --
ER 2190 DIMLN$(5,5)
PA 2200 FORI=1TO5:READD1,D2:SL
        (I)=D1:CL(I)=D2:NEXT
JH 2210 DIMP(20):FORI=1TO20:RE
        ADD:P(I)=D:NEXT:FORI=1
        TO8:KEY(I),"":NEXT
BC 2220 FORI=3584TO3709:READDT
        :POKEI,DT:NEXT:K=1:FOR
        I=2048TO2094:READDT:PO
        KEI,DT:NEXT:SYS2048:GO
        TO80
HJ 2230 DATA 8192,9192,10192,1
        1192,12192,13192,14192
        ,15192,4864,5864
JB 2240 DATA0,32,232,35,208,39
        ,184,43,160,47,136,51,
        112,55,88,59,0,19,232,
        22
CC 2250 DATA 162,0,160,0,165,1
        83,133,167,165,184,133
        ,168,165,186,133,170,1
        65,187,133,171,165,177
        ,133,172,165,178,133,1
        73,165,179,133,174,165
        ,180,133,175,132,199
EH 2260 DATA 132,200,177,167,1
        45,172,177,170,145,174
        ,24,165,167,105,1,133,
        167,165,168,105,0,133,
        168,24,165,170,105,1,1
        33,170,165,171,105,0,1
        33,171,24,165,172,105
SS 2270 DATA 1,133,172,165,173
        ,105,0,133,173,24,165,
        174,105,1,133,174,165,
        175,105,0,133,175,24,1
        65,199,105,1,133,199,1
        65,200,105,0,133,200,1
        65,200,201,3,208,177
BE 2280 DATA 165,199,201,232,2
        08,171,96
RE 2290 DATA 120,173,20,3,141,
        25,8,173,21,3,141,26,8
        ,169,27,141,20,3,169,8
        ,141,21,3,88,96,101,25
        0,165,212,201,59,240,4
        ,201,0,208,6,169,0,133
        ,244,133,245,108,25,8
XD 2300 DATA 128
```

G

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128 ALIAS

Will Steinsiek

Have you experienced problems while working with external devices? This utility banishes unfriendly device numbers on both the 64 and the 128.

The Commodore 64 did a lot to popularize low-cost disk drives and printers. Unfortunately, these devices are not always user-friendly. In fact, working with the different device numbers common to disk drives, printers, and cassette drives can be a major source of frustration.

Take the load command, for instance. When the 64 was introduced, Commodore had no idea that disk drives would become as popular as they are today. Instead, the company thought that most 64 owners would opt for the cheaper cassette drives. That's why LOAD and other commands default to this device.

Things are even worse when you have multiple disk drives or two printers. When you try to load files from your new 1581 disk drive, you need to append ",9" to the load command. To output to a second printer (device 5), often you must unplug the printer and then plug it back in at least once before you're successful.

With *Alias*, you can eliminate these and other problems. This program lets you change the device number assigned to any device; commands that you issue are now redirected to the device of your choice. For example, you can redefine device 8 as device 1 so that the load command defaults to the disk drive instead of the cassette drive. Similarly, you can change device 8 to device 9 so that the files on your second disk drive load properly and 128 DOS commands like SCRATCH work without a ",U9" appended to the end of them.

Getting Started

Although *Alias* is written in machine language, it's listed here as a BASIC loader that runs on both the 64 and the 128. To ensure accurate typing, use *The Automatic Proofreader*, found elsewhere in this issue, to enter the program. If you intend to use the program with a 64 only, enter lines 10–350. If you plan to use *Alias* on a 128 as well, enter the entire program; be sure to type it in from 128 mode so that any BASIC 7.0 keywords will be tokenized properly.

When you run *Alias*, some general instructions and a list of valid device numbers are displayed. The machine language is then POKEd into memory and activated.

Once *Alias* is enabled, you can change device numbers from immediate mode or from program mode. To reassign a device number on the 64, enter

```
POKE 780,A:POKE 781,B:SYS 53000
```

where A is a device's default number and B is the number you'd like it to have. To reassign a device number on the 128, use a command with the syntax

```
SYS 6900,A,B
```

where A and B have the same meanings as in the 64 command. To restore a device's number, simply set both A and B to the default for the device.

In its present form, *Alias* does not reassign any device numbers when it's run. However, you can cause it to do so by changing the second value in each pair of numbers in line 350. The first number in each pair is the default number for each device; the second number is the device number that will be assigned when you run the program. If you modify this line, be careful not to assign the same number to two or more devices.

For example, suppose you wished to change device 8 to 10 and device 9 to 8. To do this, you'd add the following line to the program:

```
350 DATA0,0,1,1,2,2,3,3,4,4,5,5,8,10,9,8
```

Finally, to disable *Alias*, restoring the default device numbers in the process, press the RUN/STOP–RESTORE key combination. To reenable the 64 version, type SYS 53052; to reenable the 128 version, type SYS 6952.

Alias

```
HQ 10 REM COPYRIGHT 1990 COMPU
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RB 20 M=1:PRINT"{CLR}{RVS}"TAB
      (15)"ALIAS":IFPEEK(65530
      )=5THENM=2:BANK15
ER 30 PRINT"{2 DOWN}THIS PROGR
      AM ALLOWS YOU TO DIVERT
      {SPACE}ALL"
GH 40 PRINT"INPUT OR OUTPUT FR
      OM ONE DEVICE TO "
FQ 50 PRINT"ANOTHER.":IFM=2THE
      NPRINT
KD 60 PRINT"USE THE COMMANDS:"
      :IFM=1THENPRINT"POKE780,
      A:POKE781,B:SYS53000":GO
      TO80
```

```
QA 70 PRINT"SYS6900,A,B"
HP 80 PRINT"WHERE A = THE CURR
      ENT DEVICE # AND":PRINT"
      B = THE NEW DEVICE #."
EM 90 PRINT"{DOWN}TO MAKE A AN
      D B THE SAME AGAIN, TYPE
      "
PC 100 IFM=1THENPRINT"POKE780,
      8:POKE781,8:SYS53000":G
      OTO120
ED 110 PRINT"SYS6900,8,8"
AM 120 PRINT"{DOWN}VALID DEVIC
      E NUMBERS ARE:{DOWN}"
BE 130 PRINT"0 - KEYBOARD
      {3 SPACES}4 - PRINTER 1
      "
JS 140 PRINT"1 - CASSETTE
      {3 SPACES}5 - PRINTER 2
      "
FH 150 PRINT"2 - RS232
      {6 SPACES}8 - DISK DRIV
      E 1"
EK 160 PRINT"3 - SCREEN
      {5 SPACES}9 - DISK DRIV
      E 2"
SC 170 IFM=2THEN370
JC 180 FORJ=53000TO53185:READQ
      :X=X+Q:POKEJ,Q:NEXT
RJ 190 IFX<>26532THENPRINT"ERR
      OR IN DATA STATEMENT.":
      STOP
SG 200 FORI=53186TO53201:READQ
      :POKEI,Q:NEXT
MX 210 SYS53052:END:REM ACTIVA
      TE
FF 220 DATA141,191,207,142,193
      ,207,140,192,207,160,3,
      185,191,207,205
EJ 230 DATA191,207,208,17,173,
      191,207,153,191,207,200
      ,173,193,207,153
MF 240 DATA191,207,136,76,50,2
      07,200,200,192,19,208,2
      25,173,191,207
XQ 250 DATA172,192,207,174,193
      ,207,96,173,26,3,141,18
      3,207,173,27
MA 260 DATA3,141,184,207,169,1
      27,141,26,3,169,207,141
      ,27,3,173
CK 270 DATA48,3,141,186,207,17
      3,49,3,141,187,207,169,
      133,141,48
BS 280 DATA3,169,207,141,49,3,
      173,50,3,141,189,207,17
      3,51,3
FF 290 DATA141,190,207,169,139
      ,141,50,3,169,207,141,5
      1,3,96,32
JX 300 DATA145,207,76,182,207,
      32,145,207,76,185,207,3
      2,145,207,76
QJ 310 DATA188,207,141,191,207
      ,140,192,207,142,193,20
      7,160,3,185,191
QD 320 DATA207,197,186,208,10,
      200,185,191,207,133,186
      ,136,76,50,207
RH 330 DATA200,200,192,19,208,
      233,76,50,207,76,189,23
      9,76,108,242
FH 340 DATA76,78,245,0,0,0
JM 350 DATA0,0,1,1,2,2,3,3,4,4
      ,5,5,8,8,9,9:REM ASSIGN
       DEVICE NUMBERS
AH 360 REM 128 ONLY
XC 370 RESTORE410:FORJ=6900TO7
      085:READQ:X=X+Q:POKEJ,Q
      :NEXT
CG 380 IFX<>19532THENPRINT"ERR
      OR IN DATA STATEMENT.":
      STOP
HC 390 RESTORE350:FORI=7086TO7
      101:READQ:POKEI,Q:NEXT
PJ 400 SYS6952:REM ACTIVATE
PG 410 DATA141,171,27,142,173,
      27,140,172,27,160,3,185
      ,171,27,205
RS 420 DATA171,27,208,17,173,1
      71,27,153,171,27,200,17
      3,173,27,153
HX 430 DATA171,27,136,76,30,27
      ,200,200,192,19,208,225
      ,173,171,27
CD 440 DATA172,172,27,174,173,
      27,96,173,26,3,141,163,
      27,173,27
ES 450 DATA3,141,164,27,169,10
      7,141,26,3,169,27,141,2
      7,3,173
GC 460 DATA48,3,141,166,27,173
      ,49,3,141,167,27,169,11
      3,141,48
DK 470 DATA3,169,27,141,49,3,1
      73,50,3,141,169,27,173,
      51,3
XK 480 DATA141,170,27,169,119,
      141,50,3,169,27,141,51,
      3,96,32
RQ 490 DATA125,27,76,162,27,32
      ,125,27,76,165,27,32,12
      5,27,76
EK 500 DATA168,27,141,171,27,1
      40,172,27,142,173,27,16
      0,3,185,171
FD 510 DATA27,197,186,208,10,2
      00,185,171,27,133,186,1
      36,76,30,27
BP 520 DATA200,200,192,19,208,
      233,76,30,27,76,189,239
      ,76,108,242
AD 530 DATA76,78,245,0,0,0
```

G

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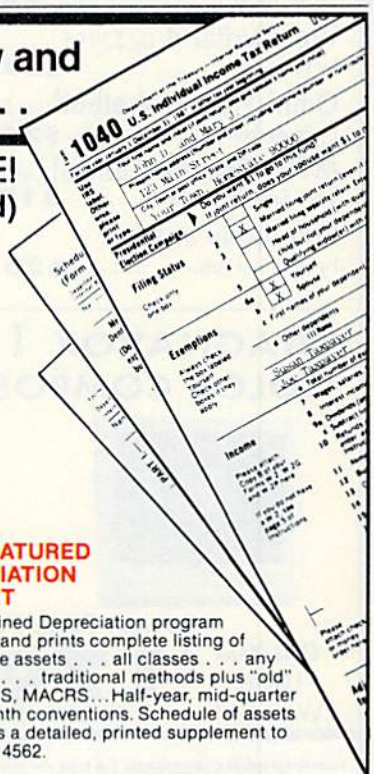

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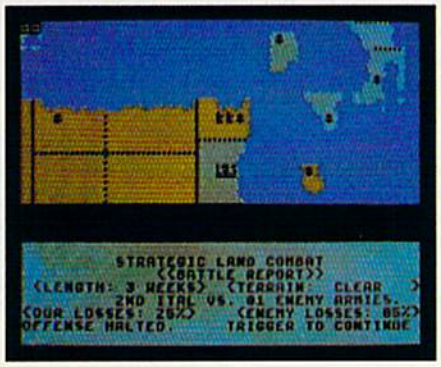
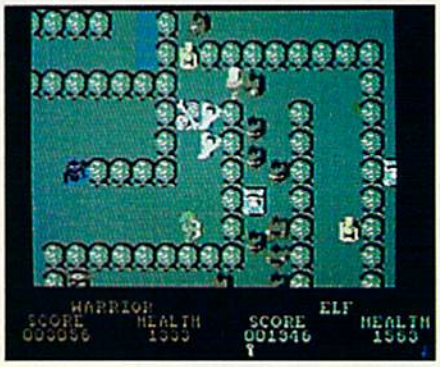
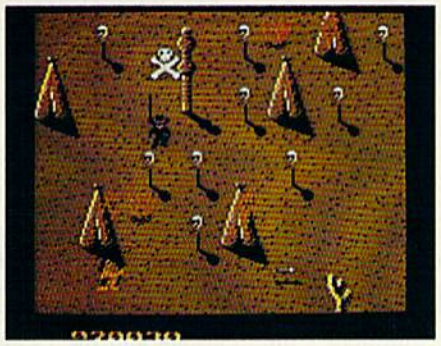


Storm Across Europe
Comprehensive strategic simulation of World War II p. 60



Gauntlet II Thor, Thyra, Questor, and Merlin continue their noble adventures p. 60



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Storm Across Europe

Storm Across Europe recreates war on a grand and unprecedented scale. Its sweep is far-reaching, encompassing the European theater of operations in World War II in its entirety, from the mountains of Morocco in the west to the edge of Siberia in the east.

The design itself embraces practically every important facet of the conflict. You can undertake Battle of Britain–type strategic-bombing campaigns, send German raiders to prey on Allied shipping in the Atlantic, and even devote resources toward gaining the technology to build the first atomic bomb. It's all here in impressive detail.

> *This game is a sophisticated, compelling simulation of the 1939–45 war in Europe.*

Despite its depth and breadth, *Storm Across Europe* rates no more than average in complexity because of some judicious abstractions and simplifications. Taken individually, the land, air, naval, and economic subsystems are very basic both in their specifics and their applications. But it's the interaction of these subsystems that makes the game a sophisticated, compelling simulation of the 1939–45 war in Europe.

The sheer scope of decision making the game requires is sometimes daunting, especially as the war expands into North Africa, Russia, and Asia. Fortunately, the system for entering orders simplifies the process considerably. Whenever you initiate an action, a set of prompts or markers appears on the screen, indicating your range of options. For instance, when an army moves to a port, the computer informs you whether enough transports are present to embark the unit. It also marks every port that could serve as a legal destination for the ships. In this way, the friendly user interface lightens your responsibilities, freeing your mind to concentrate on strategy rather than on specific rules.

For the most part, *Storm Across Europe* addresses its subject from a strategic perspective. Turns equal three months, and units represent armies or fleets of ships and planes. In keeping with this scale and focus, most of the game's mechanics are straightforward: You move; then you fight. However, simple in design does not mean simple in execution. A range of factors affect the outcome of land battles, including terrain, troop efficiency, air support, and supply. The routines for resolving naval combat follow an even more intricate sequence, with land-based air support, submarines, fleets, and escorts all converging in battle as convoys attempt to pass through different sea areas.

The one place where the game errs is in its treatment of movement. The rules allow you to redeploy your units across friendly territory without restriction and attack in the same turn. Now, this would be fine if all of Europe had been serviced by unlimited high-speed trains. But seeing as how this wasn't so, the freewheeling maneuvers the game lets you carry out are blatantly unrealistic, even by modern standards.

Questions of realism aside, in game terms, the lack of limitations on an army's ability to move and fight detracts from play in two ways: It greatly reduces the importance of planning and squelches the effects of surprise. Caught off-guard by an Allied invasion of France while mired in your own offensive in the Ural Mountains? No problem. The flick of a joystick transfers a half-dozen armies across the continent and drives the invaders back into the English Channel. Historically, if the Germans had possessed this capability to shift troops between fronts, they probably would never have lost the war.

Like many of the other war games published by Strategic Simulations, *Storm Across Europe* is built around an extensive database. In fact, the game almost buries you beneath an avalanche of numbers. For example, the map is divided into more than 200 land areas, each of which is rated for population, raw material, industry, garrison, and air-defense levels. Armies, in turn, are made up of varying quantities of infantry, mechanized troops, armor, paratroops, and tactical air points. Get the idea?

Manipulating all these numbers can grow tiresome after a while and leave you feeling more like an accountant than a general. The key to enjoying and appreciating *Storm Across Europe*, then, is to keep in mind the larger picture. The game depicts a continent engulfed by war, and you should construct your strategies in the same broad context and not concern yourself with smaller details.

Although the design is not without its flaws, *Storm Across Europe* achieves perfection in fulfilling its intent. The game integrates the economic and military aspects of World War II in a clean, engaging format that simultaneously entertains, instructs, and challenges you.

—Jeff Seiken

Storm Across Europe
Strategic Simulations
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Gauntlet II

Assuming multiple personalities may be considered unusual in some circles, but in the fantasy world of computer gaming it's most desirable—and downright fun. Mindscape's *Gauntlet II* allows players to assume the roles of four heroes, each with different powers and capabilities.

Just as they fought against the forces of evil at your local arcade, Thor the Warrior, Thyra the Valkyrie, Questor the Elf, and Merlin the Wizard invade your personal computer to continue their noble adventures.

> *The most difficult part of Gauntlet II? Trying to quit playing.*

A single player, or a second player acting as an ally, assigns any of the four heroes as his or her alter ego. Once selected and empowered with unique abilities, the players wade into a villainous horde of monsters and evil traps that occupy 100 new mazes of the Dark Dungeons.

If you enjoy arcade-style games, *Gauntlet II* will consume you with fast-paced shoot-'em-up action and mind-bending puzzles. Time flies as players delve deeper and deeper into the dungeon world. Trying to quit playing is the most difficult part of *Gauntlet II*.

Players begin the game with 2000 health points as they search the mazes for treasure and instruments of magic. Time erodes a player's health as do encounters with any of the seven types of monsters that swarm to attack. Destroy the monsters and the Generators (the machines that mass-produce them) before you are overwhelmed. Acid puddles, force fields, and traps that can sap your strength should also be avoided, if possible.

Each level of the maze must be solved and an exit found before players may advance to the next level. Food and cider, found along the way, extend your life by adding 100 health points to your score.

Your session comes to an end when your health drops to 0. You must then restart the game from the beginning. When two players tackle the game together, however, there are definite advantages. The most obvious is the ability to protect one another by using each player's respective talents against a diverse group of villains and threats. Another important advantage is the ability to rejoin your partner after your health points have expired. As long as one player continues to hold his or her own against the horde, the com-

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panion may return to the fray at the present level, rejuvenated with 2000 health points.

Players may pick up and carry only a limited number of items as they trek about the game. Keys are very useful, as are the powerful magic potions and amulets. Use the keys to eliminate barriers that prevent your movement inside the mazes. Amulets and potions, once found, increase your powers in magnificent ways.

Treasure rooms appear randomly, allowing players to sprint around, scooping up as much treasure as possible. To keep the treasure, they must find the exit and escape to the next level before time runs out. Phony exits and poisoned food, cider, and potions add an extra element of danger and can prove fatal to the unwary.

A long list of foes stand against you in *Gauntlet II*. The most formidable are characters known simply as Death. They will try to attach themselves to the heroes, drain up to 200 health points from their victim, and then die themselves. Fighting Death characters hand-to-hand or shooting at them is useless. Only certain magic potions can rid the screen of these dreaded leach-like monsters.

Gauntlet II is just what the wizard ordered for home dungeon-arcade addicts. It's a quality arcade-style action game that exercises the brain as well as the wrist and thumb. The option to assume a different hero's persona with different abilities each time you play spices up an already challenging adventure.

—Steve Hedrick

Gauntlet II
Mindscape
3444 Dundee Rd.
Northbrook, IL 60062
$29.95

Shoot 'Em Up Construction Kit

Let's face it. Within even the most serious-minded, efficient, hard-working, dedicated computer user lurks a tiny gremlin whose only desire is to get out and shoot, bomb, blast, and otherwise annihilate anything in its path.

Some people have no problem indulging this imp's appetite. Others of us sidle along the aisle and grab a shoot-'em-up off the shelf, telling the cashier, "It's for the kids." We wear trenchcoats and oversized fedoras as we slouch into arcade rooms to drop some quarters. Or we order games in plain brown wrappers from anonymous distributors in Paducah. After all, we wouldn't be caught dead using our computer to *play!*

Enter Avantage. Now we have a legitimate excuse to roam through strange landscapes blasting away at purple aliens or enemy armies. *Shoot 'Em Up Construction Kit*, which comes with three ready-to-play games, enables us to design our own games of destruction. And what good game designer doesn't check out his or her own creation?

Any game you create with *Shoot 'Em Up Construction Kit* will be complete with hero, enemies, weapons, and sound effects. There's even a screen where you can write an introduction to your hot new game for uninitiated players. Since it takes time to create one of these games, you can save your creation at any stage. When you've finished designing your game, save it to its own disk and it will run independently of *Construction Kit* (a great gift for your fire-happy friends).

Now we have a legitimate excuse to roam through strange landscapes blasting away at purple aliens or enemy armies.

You can either jump right in creating your game from scratch or get your feet wet by revising the games included: Space Hawk, Outlaw (a Western shoot-'em-up), and Transputer Man. Either way, this kit is a powerful tutorial in game design.

The Main Menu is your doorway to creation. The various editors are all accessed from here. These include editors for sprites, objects, background, sound effects, player limitations, attack waves, levels, and the front end. Test Game, also listed on the main menu, allows you to test your game in either Regular mode or Cheat mode, the latter of which gives you an infinite number of lives.

A computer game is laid down in layers, rather like an animated cartoon. Pixels comprise characters, which make up blocks; blocks, in turn, combine to become the background. Other pixels make the sprites that make objects—objects being a hero, an enemy, an explosion sequence, or anything that moves. Sound effects are assigned and can themselves be modified in terms of waveform, pitch, attack, and decay.

Players' limitations are defined. Enemies are placed and assigned routes of travel. The map areas and pattern of playing levels are chosen—scrolling versus still screen versus push screen (forward movement governed by the hero's action). Then the introduction and its special effects provide the finishing touches.

With *Shoot 'Em Up Construction Kit*, you are guided through the intricate process of layering and building until you have produced a finished game of reasonable arcade quality. Each component is available to you for design or modification. You have complete control.

A fascinating aspect of *Construction Kit* becomes apparent when you toy with one of the existing games. Gradually modify pieces of it and then check it out to see where the changes turn up. Since everything is made of linked components, changes you make can turn up in weird places as a modified character or sprite is incorporated. This is a great way to learn your way around this program, but the first time you see the consequences and the capabilities of what you're working with strike home, it's awesome.

Criticisms of this program are few. Depending on the make of your monitor, your screen may not be large enough to display the score (lower left border) or a couple of prompts used in one of the editors. This was true of our Commodore 1701. The character set used in writing the front-end text can be modified. However, there are some characters that we had trouble figuring out how to get on the screen. Pressing the logical keys didn't work, and there is nothing that tells you how to reach them. We never did get the hyphen.

The only general drawback to this kit is that the block-and-pixel nature of game construction limits you to a fairly geometric, even linear, design. For instance, we found it extremely difficult to design a curved stretch of road. (Heck, we found it impossible, but that's not to say that an extremely talented game maker couldn't do it.) Everything else in the kit is great, and to reuse a word, awesome.

Shoot 'Em Up Construction Kit, while setting out to be a toolkit for entertainment, is actually a deep program that helps you explore and gain command of the intricacies of game making. We played the games. We toyed with the editors. And while we may never have the dedication and patience it takes to painstakingly construct a commercial shoot-'em-up, we now have a better understanding and respect for the game designers who do.

—David and Robin Minnick

Shoot 'Em Up Construction Kit
Avantage
Distributed by Accolade
550 Winchester Blvd.
Suite 200
San Jose, CA 95128
$14.95

World Geography

A program is good when it does what it sets out to do. If it does it smoothly, uses eye-catching graphics and tuneful responses, and does it with a minimum of fuss, then it is elegant. This may be an unusual statement about an educational package, but *elegant* is the word that best describes *World Geography* from Bobco.

The program sets out to help you learn some essential facts about 175 of the world's nations. These facts include the country's location, capital, currency, official language, and population. Considering the changing political boundaries and population figures, it is laudable that Bobco periodically issues updated versions of *World Geography*. (These can be purchased direct from Bobco by current owners for just $7. The 1990 version should be available early this year.)

Any student will tell you: Memorizing facts is b-o-r-i-n-g! Any teacher will tell you that some things can't be learned any other way. The solution? Make the dull as interesting as possible, use multiple stimuli, keep the brain active. Nothing stimulates like a game—whether you're playing against an opponent or merely pitting yourself against a previous score. *World Geography* is a package made-to-order to these specifications. It uses multiple-choice questions, visual aids in the form of maps, a simple but accurate rotating globe, and aural stimuli in the form of music played while the globe spins and when questions are answered.

Options to be selected at the outset include 1-Player, 2-Player, or Review (answers automatically displayed); Novice, Intermediate, or Expert; and Geographic Area: America & Pacific, Eurasia, Africa, and All.

The globe rotates in a window on the right side of the screen. As it spins, the disk drive searches for a country. When one is found, the globe halts with the continent of the selected country facing front. A relief-type map of the country appears on the left, with its flag displayed nearby. A blinking light locates the capital city on both the globe and the map.

The first question asked is the name of the country. The other four questions—capital, language, currency, and population—follow in random order. Three possible answers are offered for each.

Scoring is based on how long it takes you to answer. A timer starts as each question comes up. The quicker you answer, the higher your score.

You begin with five countries. Each time you score 10,000 points, you gain two countries and a Bonus Flag question. (Here you must choose a given country's flag from among three displayed.) With a system like this, players are encouraged to keep playing. Those who are just starting out are not daunted by facing a too-big chunk of material. Intermediate scholars persevere to stay in the game, and smart players can keep going forever.

There's nothing to dislike about *World Geography*. Bear in mind, it's an educational game with the emphasis on education. But lovers of trivia games also will be satisfied with the format, and for learning these facts, it's a gem!

We checked some of the information presented, and it appears to be accurate and up-to-date. The maps and flags are excellently rendered, a tribute to the programmer's abilities. Assembling all this material and designing the necessary graphics is an awesome accomplishment. The concept is educationally sound, and the execution is flawless.

—David and Robin Minnick

World Geography
Bobco
200 Seventh Ave.
Suite 111
Santa Cruz, CA 95062
$24.95

Aussie Games

Blokes and sheilas should have a bonza time with this ripper from Mindscape titled *Aussie Games*. Even if you're a simple seppo like myself and don't understand Strine, check out the manual's glossary and get set for a fair-dinkum treat.

Aussie Games is a two-disk collection of six recreational, true-blue Australian games. Don't expect to see these events in the next Olympics though—this Aussie six-pack is a half-dozen of the wackiest sports you'll find anywhere this side of Alice Springs.

By the way, in case you aren't sure, you blokes and sheilas (guys and gals) might like to know that in Strine (the Australian language) *bonza* means extremely good, *ripper* is any excellent thing, *seppo* refers to us Yanks, and *fair-dinkum* is anything real.

Aussie Games allows players to choose the order of events offered. Try all of the events in order by picking Aussie Safari, compete in the event of your choice, or simply practice your favorite event.

The Safari takes you to a number of spots throughout Australia. Your first stop is Sydney, where you attempt the sport made famous by kids on spring break: the Belly Whack. The objective is to get the biggest splash without running out of time. First, your diver has to take a few good breaths; then you press the fire button to begin the flop. The challenge comes in keeping the diver from going head or feet first.

From Sydney you move to Melbourne for Beach Footy. Using the fire button, kick the football as far as you can and then position your onscreen partner to catch the ball. Catching it is difficult but not impossible. Even if you miss the ball, you receive points for the distance it's kicked. Try to do well here because the sheilas are watching.

Next it's off to the bush for a go at boomerang competition. Getting the hang of throwing the boomerang is only half the battle. The boomerang is going to come back. Then you must decide whether to simply reach out and grab it, jump for it, or duck. As in Beach Footy, you receive points for distance; extra points are awarded if you catch it. Mind your head with this one.

Now, on to Ayres Rock for the Dry River Race. This is not meant for the weak of arm because you and a friend have to carry the boat in this event. To get your team going, move the joystick back and forth quickly. Be sure to jump over the many obstacles in the way. If you stumble over one, it'll slow you down or stop you completely; this means you have to build up your speed again. You'll be ready for a breather after this event.

You get a break when you go to Top End for the Beer Shoot because you get to ride in the back of a truck. While your sober mate drives, another bloke tosses beer bottles for you to shoot. Easy you say? Not when the road curves like this one does. By the way, watch out for the birds flying by. You do not get points from bird lovers for hitting them.

Finally you reach Cairns for a little Marlin Fishing worthy of Hemingway. This is an extremely tough event. You must cast your line right next to the swimming marlin or it won't bite. If it doesn't hit your lure, keep casting until it does. Once you've hooked the fish, reel it in carefully or your line might break. Watch out if you manage to land it—it will try to jump over the edge of the boat.

Aussie Games is an exciting program with fast-paced events. The graphics are colorful and often funny, particularly during the Belly Whack. In addition to the sound effects in each event, many of the games have Australian tunes such as "Waltzing Matilda" and "Botany Bay" playing in the background for an added touch of authenticity. Get ready for some fun with this one—you'll find it dinki-di.

—Alison Fleming

Aussie Games
Mindscape
3444 Dundee Rd.
Northbrook, IL 60062
$29.95

Raster Master

EDITOR'S CHOICE

Peter M. L. Lottrup

ADD SENSATIONAL VIDEO EFFECTS TO YOUR BASIC PROGRAMS WITH THIS POWERFUL MACHINE LANGUAGE UTILITY FOR THE 64. DEMO INCLUDED.

Want to spice up text-screen presentations in your BASIC programs? If so, try *Raster Master*. This short machine language routine creates a dramatic windowing effect like none you've seen before.

This effect is achieved using a two-step process. First, you position some text in a designated window area. To make the text invisible, you print it in the color of the screen background. Then you call *Raster Master*. At a rate you specify, each screen line in the window area is changed to a contrasting color. As this process continues, the hidden text within the window is gradually revealed.

Typing It In

Raster Master is written entirely in machine language, so you'll need to use *MLX*, the machine language entry program found elsewhere in this issue, to type it in. The *MLX* prompts, and the values you should enter, are as follows:

Starting address: C000
Ending address: C13F

Enter the data for *Raster Master*. Before you exit *MLX*, save a copy of the program to disk with the name RASTER.ML.

Raster Master Demo, written in BASIC, illustrates some of the typical effects that are possible with *Raster Master*. Type it in using *The Automatic Proofreader*, also found in this issue, and save a copy of the program to disk.

Four Commands

By using the 64's raster-interrupt routine, *Raster Master* lets you change a vertical portion of the text screen to another color. Four SYS commands are all that's required.

The first command, SYS 49152, activates the utility. Call it once near the beginning of your program.

The second SYS command is responsible for opening the text window. The syntax for this command is

SYS 49155,*color*,*row*[,*number of rows*][,*speed*]

Color (0–15) is the color you want in the opening window (also stored in location 2). *Row* is the number of the screen line (0–255) on which the window will be located. Remember: As with the 64's standard sprite-coordinate system, only screen lines in the range 50–249 are on the visible portion of the screen.

The two optional parameters are *number of rows* and *speed*. *Number of rows* determines how many screen lines in each direction (up and down) the window should cover. A value of 4, for example, creates a window eight lines high. If you don't include this parameter, *Raster Master* assumes maximum size (the whole screen).

Speed determines the opening speed of the window. Any value in the range 0–255 may be used, with higher numbers representing slower speeds. If you don't include this parameter, an average speed of 30 is used.

The next command, SYS 49158, closes an opened window. The window closes at the rate assigned when the window was opened.

The final command, SYS 49161, disables the utility and restores the standard IRQ interrupt vector. Use this command to turn off the utility while you change the background screen color or when you've finished with all window displays. To reactivate the utility, use SYS 49152.

The Demo

When you're ready to see *Raster Master* in action, place the disk containing RASTER.ML in the drive; then load and run the demo. The demo illustrates a variety of effects: Small-width windows are generated by concealing a portion of the raster band with sprites, separate areas of text are revealed in sequence, windows are opened and closed at different rates, and a selection-bar menu is simulated.

To help you understand the setup for each effect, the demo has been commented liberally. Note the use of locations 820 and 821 in this program. To

prevent the screen from flashing, windows are initially established offscreen using these locations. Then they're moved onto the screen with the SYS 49155 command.

RASTER.ML

```
C000:4C 0C C0 4C 61 C0 4C FF 2E
C008:C0 4C 19 C1 78 A9 30 8D 94
C010:14 03 A9 C0 8D 15 03 58 BC
C018:AD 21 D0 8D 3C C1 8D 12 C1
C020:D0 AD 11 D0 29 7F 8D 11 18
C028:D0 A9 81 8D 1A D0 58 60 AA
C030:AD 19 D0 8D 19 D0 30 07 35
C038:AD 0D DC 58 4C 31 EA AD 9F
C040:12 D0 CD 35 03 B0 0B A4 A1
C048:02 8C 21 D0 AD 35 03 4C B3
C050:5B C0 AC 3C C1 8C 21 D0 5C
C058:AD 34 03 8D 12 D0 4C BC 20
C060:FE A9 FA 8D 34 03 A9 01 06
C068:8D 35 03 20 73 00 20 8A C6
C070:AD 20 F7 B7 C0 10 B0 3F 32
C078:84 02 20 FD AE 20 8A AD 59
C080:20 F7 B7 8C 34 03 8C 35 CB
C088:03 EA 20 79 00 F0 2D C9 C9
C090:2C D0 F7 20 73 00 20 8A C3
C098:AD 20 F7 B7 8C 39 C1 20 60
C0A0:79 00 F0 1D C9 2C D0 F7 67
C0A8:20 73 00 20 8A AD 20 F7 5C
C0B0:B7 8C 3A C1 4C C6 C0 A2 36
C0B8:05 6C 00 03 A9 FF 8D 39 A9
C0C0:C1 A9 1E 8D 3A C1 EA A9 82
C0C8:00 8D 3B C1 20 2B C1 AD 10
C0D0:34 03 F0 03 CE 34 03 AD 76
C0D8:35 03 C9 FF B0 03 EE 35 93
C0E0:03 EE 3B C1 AD 3B C1 CD CE
C0E8:39 C1 B0 12 C9 FF F0 0E EC
C0F0:AD 34 03 C9 00 D0 D5 AD EF
C0F8:35 03 C9 FF 90 CE 60 20 AF
C100:2B C1 EE 34 03 AD 34 03 E4
C108:CD 35 03 F0 0B CE 35 03 30
C110:AD 35 03 CD 34 03 D0 E7 2C
C118:60 A9 00 8D 1A D0 78 A9 BD
C120:EA 8D 15 03 A9 31 8D 14 90
C128:03 58 60 A0 00 A2 FF CA AE
C130:D0 FD C8 CC 3A C1 90 F5 71
C138:60 00 00 00 00 00 00 00 EB
```

Raster Master Demo

```
HQ 10 REM COPYRIGHT 1990 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
HB 20 GOSUB710:REM GO SET UP C
      OVER-UP SPRITES
FM 30 IF PEEK(49152)<>76 THEN
      {SPACE}LOAD"RASTER.ML",8
      ,1
PX 40 SYS49161:REM DISABLE ROU
      TINE IN CASE IT'S ACTIVE
AP 50 DIMV$(25):V$(0)="{HOME}"
      :FORI=1TO24:V$(I)=V$(I-1
      )+"{DOWN}":NEXT:POKE5328
      0,0
DF 60 REM CREATE 1-LINE WINDOW
       OFFSCREEN TO PREVENT SC
      REEN FLASHES
FF 70 POKE820,250:REM PLACE WI
      NDOW Y-COORDINATE IN 820
CJ 80 POKE821,1:REM ASSIGN NUM
      BER OF LINES (1) IN WIND
      OW IN 821
RM 90 REM POSITION COVER-UP SP
      RITES ON EITHER SIDE OF
      {SPACE}WINDOW TO SIMULAT
      E MARGINS
HB 100 POKE53248,10:POKE53249,
       120:REM SPRITE0 X POSIT
       ION, SPRITE0 Y POSITION
MP 110 POKE53252,40:POKE53253,
       120:REM SPR2 X POSITION
       , SPR2 Y POSITION
DX 120 POKE53248+16,12:REM SET
        HIGH BIT OF SPR2 AND S
       PR3 HORIZONTAL COORDINA
       TE
DE 130 POKE53248+21,15:REM ENA
       BLE SPRITES 0-3
CF 140 POKE53281,0:PRINT"{CLR}
       {BLK}"V$(12)TAB(5)"COMP
       UTE!'S GAZETTE PRESENTS
       :"
KK 150 SYS49152:SYS49155,3,150
       ,10,50:REM OPEN WINDOW
BF 160 GOSUB700:SYS49158:GOSUB
       700:REM PAUSE AND THEN
       {SPACE}CLOSE WINDOW
HB 170 POKE53250,40:POKE53251,
       120:REM SPR1 X POSITION
       , SPR1 Y POSITION
XS 180 POKE53254,10:POKE53255,
       120:REM SPR3 X POSITION
       , SPR3 Y POSITION
CH 190 PRINTV$(12)TAB(5)"
       {8 SPACES}RASTER MASTER
       {9 SPACES}"
RM 200 SYS49155,6,12*8+54,10,5
       0:GOSUB700:SYS49158:GOS
       UB700
RX 210 POKE53248+21,0:REM DISA
       BLE ALL SPRITES
GQ 220 PRINT"{CLR}"V$(8)TAB(7)
       "FANTASTIC PRESENTATION
       S"V$(10)TAB(14)"FOR ALL
        YOUR"
BQ 230 PRINTV$(12)TAB(21)"PROG
       RAMS"
BH 240 SYS49155,11,12*8+42,50,
       20:GOSUB700:GOSUB700
BM 250 PRINTV$(9)TAB(7)"{4}ALL
        CREATED"V$(11)TAB(14)"
       WITH THE HELP"
XM 260 PRINTV$(13)TAB(21)"OF R
       ASTER MASTER"
DF 270 SYS49158:GOSUB700:GOSUB
       700
CA 280 POKE53280,0:PRINT"{CLR}
       ":FORTT=1TO3
KA 290 PRINTV$(8)"{3 SPACES}
       {BLK}THIS IS THE
       {13 SPACES}"V$(10)TAB(7
       )"MIXUP EFFECT"
EA 300 PRINTV$(12)TAB(12)"MIXI
       NG SCREEN TEXT..."
GS 310 POKE820,250:POKE821,1:S
       YS49155,6,12*8+50,50,10
       :GOSUB700
CP 320 PRINTV$(7)"{3 SPACES}
       {BLU}SEE HOW THIS"V$(9)
       TAB(7)"TEXT APPEARS AS"
AR 330 PRINTV$(15)TAB(12)"THE
       {SPACE}OTHER DISAPPEARS
       "
JK 340 SYS49158:NEXT
RX 350 GOSUB700:GOSUB700
RC 360 PRINT"{CLR}{8}THIS IS T
       HE CURTAIN EFFECT{BLK}"
MQ 370 FORI=2TO22:PRINTV$(I)TA
       B(9)"COMPUTE!'S GAZETTE
       ":NEXT
EE 380 POKE820,250:POKE821,1:S
       YS49155,15,250,200,20:G
       OSUB700:GOSUB700
HS 390 PRINT"{HOME}{37 SPACES}
       "
BE 400 SYS49158:PRINT"{CLR}":S
       YS49161
CK 410 POKE820,250:POKE821,1:P
       OKE53280,6:POKE53281,6:
       SYS49152
QR 420 SYS49155,2,89,1,50:VX=8
       9:POKE820,VX:POKE821,VX
       +9
JG 430 PRINT"{CLR}{7}CREATE A
       {SPACE}MENU OR SELECTOR
        BAR"
AQ 440 PRINT"{DOWN}{YEL}USE <U
       P> & <DOWN> CURSORS TO
       {SPACE}MOVE"
SA 450 PRINT"PRESS <Q> TO QUIT
       {BLK}":PRINT
CM 460 FORI=1TO9:PRINT"
       {5 SPACES}";:FORJ=1TO4:
       PRINT"LINE"STR$(I)" ";:
       NEXT:PRINT:NEXT
GK 470 FORI=10TO19:PRINT"
       {3 SPACES}";:FORJ=1TO4:
       PRINT"LINE"STR$(I)" ";:
       NEXT:PRINT:NEXT
GC 480 GETA$:IFA$="{UP}"THEN52
       0
FF 490 IFA$="{DOWN}"THEN540
PJ 500 IFA$<>"Q"THEN480
EF 510 GOTO560
SF 520 VX=VX-8:IFVX<89THENVX=8
       9
GM 530 POKE820,VX:POKE821,VX+9
       :GOTO480
XC 540 VX=VX+8:IFVX>233THENVX=
       233
SQ 550 POKE820,VX:POKE821,VX+9
       :GOTO480
BD 560 SYS49158:GOSUB700:SYS49
       161:POKE53281,0:SYS4915
       2:POKE820,250:POKE821,1
BE 570 PRINT"{CLR}{CYN}YOU CAN
        VARY SPEED AND COLOR"
RP 580 A=40:FORI=1TO7:A=A-5:SY
       S49155,INT(RND(1)*7)+7,
       90,15,A
CG 590 SYS49158:GOSUB700:NEXT:
       POKE53280,0:POKE53281,0
       :POKE820,250:POKE821,1
DK 600 POKE53248+21,15
SA 610 PRINT"{CLR}"V$(10)TAB(6
       )"{RED}QQQQQQQQQQQQQQQQ
       QQQQQQQQQQ"
EC 620 FORI=11TO13:PRINTV$(I)T
       AB(6)"Q"TAB(31)"Q":NEXT
FQ 630 PRINTV$(14)TAB(6)"{RED}
       QQQQQQQQQQQQQQQQQQQQQQQQ
       QQQ"
CM 640 PRINTV$(12)TAB(10)"
       {BLK}(R)ESTART OR (E)ND
       {CYN}"
FJ 650 SYS49155,3,150,10,100:G
       OSUB700
PD 660 GETA$:SYS49158:IFA$=""T
       HEN640
CE 670 IFA$="R"THENSYS49161:RU
       N
SS 680 IFA$<>"E"THEN640
XQ 690 SYS49161:PRINT"{CLR}
       {CYN}":END
QH 700 FORDY=1TO500:NEXT:RETUR
       N
RA 710 FORI=832TOI+63:POKEI,25
       5:NEXT:REM DEFINE SOLID
        BLOCK SPRITE
KE 720 POKE53248+23,255:POKE53
       248+29,255:REM EXPAND A
       LL SPRITES IN X AND Y D
       IRECT.
GE 730 POKE53248+27,255:REM SE
       T SPRITE PRIORITY OVER
       {SPACE}FOREGRD COLOR
SS 740 FORI=53248+39TOI+7:POKE
       I,0:NEXT:REM SET ALL SP
       RITES TO BACKGROUND COL
       OR
EA 750 FORI=2040TO2047:POKEI,1
       3:NEXT:REM SET POINTERS
        TO SPRITE DEFINITION D
       ATA
QG 760 FORI=53248TOI+15:POKEI,
       0:NEXT:REM LOCATE ALL S
       PRITES AT 0,0
BG 770 RETURN
```

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machine language programming

USR and Floating Point

Jim Butterfield

Programs on Commodore 8-bit computers normally reside within a BASIC operating system. To run a machine language (ML) program, BASIC must call it. The ML program often runs as a subroutine. When it has finished, control returns to BASIC, which continues running a program or, if no program is active, prints the READY prompt.

BASIC and machine language can work together in splendid symbiosis, each doing what it does best. This is a feature of these machines; high-end computers don't have BASIC resident in the system, and more work is necessary to graft together two languages.

The most common way to call machine language from BASIC is with the SYS command. This is a subroutine call, and the ML may return to BASIC with a simple RTS (ReTurn from Subroutine) instruction. There is another method which uses the USR( ) function.

A SYS Substitute

USR is a function like RND or SQR. As such, it must be followed by a numeric argument in parentheses, for example, X=USR(123). You can see from this that the USR function is supplied with a value (in this case, 123) and delivers a result (in this case, assigned to variable X). Only one number is passed each way; USR can't directly handle two-valued operations such as add or compare. But, because of the parameters that it can pass, USR can be quite handy as a substitute for SYS.

Although USR passes a number to the subroutine and accepts a value back, you don't have to use either value. The machine language program can ignore the value that was supplied. And BASIC can ignore the return value, although it will have to use it temporarily. In the above example, the return value is set to X, but the BASIC program could proceed without ever using variable X again. Incidentally, if the machine language program doesn't change the value supplied as part of the call, the same value will be returned. Thus, if the USR routine contained only a RTS (return) instruction, PRINT USR (77) would print 77.

How does USR know where to find the machine language subroutine? Its address is placed in the USR vector using the locations shown below.

Commodore 64:	**785,786**
Plus/4 and C16:	**812,813**
Commodore 128:	**4633,4634 (bank 0)**

USR passes its parameter from BASIC to machine language, and vice versa, using the floating-point accumulator found at the following locations:

C64, Plus/4, C16:	**97-99**
Commodore 128:	**99-104 (all banks)**

Floating-Point Format

Numbers are stored in the floating-point accumulator in *floating-point format*. The first byte contains the *exponent* of the number; the next four bytes contain its *mantissa*. If the exponent is 0, then the whole number is 0; if the exponent is not 0, then it determines where the binary point is placed in the mantissa. The mantissa multiplied by 2 raised to the value of the exponent gives you the value in the floating-point accumulator. Finally, the last byte contains the sign. If the high bit is set, the number is negative.

An example would be useful here. How would we write the decimal value 10 in floating-point format? First, convert the number to binary: 1010.000. Then pack this value into the four-byte mantissa area so that the high bit is in the high position. The first byte becomes 10100000; the remaining three bytes are 0. Now, the binary point is four positions into that first byte. So the exponent, which is always offset by $80, becomes $84. Finally, the sign bit is 0 for a positive number. The resulting hexadecimal value for 10 in floating-point format is 84 A0 00 00 00.

To read a floating-point number, you would reverse the process, writing out bits in the mantissa and then placing the binary point. Within a program, you would likely perform a series of shift/rotates to move the mantissa bits into the proper position. It's important to note that floating-point numbers that you give back to the system should be *normalized*—that is, the most significant bit must be shifted until it occupies the high-bit position of the mantissa.

Floating-point values stored in variables or arrays occupy five bytes rather than six. The trick here is to take the sign bit and use it to replace the highest bit in the mantissa (which would always normally be on).

Let's consider a short example for the Commodore 64. The BASIC program at the end of this column contains a machine language routine which tests to see if the value supplied to it is 10 or greater. If the value is too high, it's replaced with 10; otherwise, it's left alone. The program POKEs the machine code below into the cassette buffer and then accesses the USR command.

```
08BC  LDA  $61     ;check exponent for
                   0
08BE  BEQ  $08E0
08C0  CMP  #$84    ;now, for 10
                   exponent
08C2  BEQ  $08DA   ;if OK, check
                   mantissa
08C4  BCC  $08E0   ;if less than 10, exit
08C6  LDA  #$84    ;else, store exponent
08C8  STA  $61
08CA  LDA  #$A0    ;and mantissa for 10
08CC  STA  $62
08CE  LDA  #$00
08D0  STA  $63
08D2  STA  $64
08D4  STA  $65
08D6  STA  $66
08D8  BEQ  $08E0   ;and exit
08DA  LDA  $62     ;check mantissa
08DC  CMP  #$A0    ;if too high, set to
                   10
08DE  BCS  $08C6
08E0  RTS
```

This program works nicely. You'll see the second number on each line repeat the first one until the value 10 is exceeded. After that, the second value remains at this limit.

But wait! There's a logic error in the program. It tests only the value and not the sign. A negative value might not produce the desired result for the USR function. Try it out. And if you feel up to it, modify the program to allow for the negative-value situation.

```
10 DATA 165,97,240,32,201,132,
   240,22,144,26,169,132,133
20 DATA 97,169,160,133,98,169,
   0,133,99,133,100,133,101
30 DATA 133,102,240,6,165,98,2
   01,160,176,230,96
40 FOR J=828 TO 864:READ X:T=T
   +X:POKE J,X:NEXT J
50 IF T<>4865 THEN STOP
60 POKE785,60:POKE786,3:REM PO
   INT USR TO ML
70 FOR K=5 TO 15:PRINT K;USR(K
   ):NEXT K                    G
```

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• Several readers have had trouble using *Disk Doubler* (August 1989) with their 64s. If you have experienced problems with this program, you may wish to read "Double Trouble" in the December 1989 installment of "Feedback."

Many users have complained that *Disk Doubler* often stops with an error in line 370. This line attempts to write the new BAM to the side of the disk that it just formatted. If the format was unsuccessful, the program breaks with an error. If you attempt to format the disk once again, *Disk Doubler* says that the disk is already double-sided and refuses to format it. The following modifications cause *Disk Doubler* to ask whether you want to quit or format the disk anyway when this happens.

```
510 PRINT"{RVS}DISK IS ALREADY
    DOUBLE-SIDED":PRINT"{RVS}C
    {OFF}ONTINUE OR {RVS}Q{OFF}
    UIT? ";
520 GETK$:IFK$<>"C"ANDK$<>"C"A
    NDK$<>"Q"ANDK$<>"Q"THEN520
530 PRINTK$:IFK$="C"ORK$="C"TH
    EN190
540 CLOSE5:CLOSE15:RETURN
```

These changes are useful if you want to try to format the disk several times before giving up. They also enable you to destroy the second side of a disk that is already double-sided, so be careful.

• *Disk Inventory* (December 1989) loses track of the first file that it reads from the first disk. To correct this problem, change the 0 in line 150 to a 1.

```
150 DIMR$(500):CURRENT=1
```

A second problem with *Disk Inventory* is that it locks up while reading some disks. The program currently determines when there are no more filenames to read from a disk by the presence of the BLOCKS FREE message at the end of the directory listing. In rare instances, this message may be positioned so that *Disk Inventory* doesn't see it. The following changes to lines 250 and 260 correct this problem.

```
250 GET#1,X$:S=ST:IFX$<>CHR$(3
    4)ANDS=0THEN250
260 N$="":IFS<>0THEN350
```

A third problem with *Disk Inventory* has to do with reading files on write-protected disks. *Disk Inventory* detects whether or not a disk is in the drive by watching the write-protect indicator. When a disk which isn't write-protected is inserted into the drive, the write-protect indicator contains a value of 16; this indicator contains the value 0 when a disk is write-protected. When you remove a disk from the drive, the indicator changes to 0 as you pull the disk out and then changes back to 16 once the disk is clear of the drive. When you place a disk that isn't write-protected into the drive, the write-protect indicator changes to 0 as you insert the disk and then changes back to 16 once the disk is all the way in.

Disk Inventory's problem occurs when the disk you insert into the drive is write-protected. In that case, the write-protect indicator never changes back to 16 when the disk is all the way in the drive. To circumvent this problem, the program counts as it waits for the indicator to change to 16. If the counter exceeds 50, then the program assumes the disk is write-protected and tries to read it. The following lines implement this counter.

```
390 CT=0:REM FULLY INSERTED?
391 GETW$:IFW$<>""THEN480
392 PRINT#15,"M-R"CHR$(30)CHR$
    (0)
393 GET#15,Z$:IFZ$=""THENZ$=CH
    R$(0)
394 CT=CT+1:IFASC(Z$)=0ANDCT<5
    0THEN391
```

If you find that the program attempts to read the disk too quickly, you can increase the 50 in line 394.

• *Grafix Converter* (June 1989) doesn't convert *Micro Illustrator* files correctly. *Micro Illustrator* files may be saved in either a compressed or an uncompressed format. *Grafix Converter* converts to the uncompressed format but it doesn't write the header to tell *Micro Illustrator* that the file is uncompressed. To correct this problem, change line 870 and add line 1390 as follows:

```
870 PRINT"M/I FILE INFO...":FO
    R R=1TO20:READD:PRINT#2,CHR
    $(D);:NEXTR
1390 DATA 255,128,105,103,20,0
    ,0,232,3,232,3,64,31,1,0,40
    ,0,200,0,0
```

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The Automatic Proofreader

Philip I. Nelson

The Automatic Proofreader helps you type in program listings for the 128 and 64 and prevents nearly every kind of typing mistake.

Type in the *Proofreader exactly* as listed. Because the program can't check itself, type carefully to avoid mistakes. Don't omit any lines, even if they contain unusual commands. After you've finished, save a copy before running it.

Next, type RUN and press RETURN. After the program displays the message "Proofreader Active," you're ready to type in a BASIC program.

Every time you finish typing a line and press RETURN, the *Proofreader* displays a two-letter checksum in the upper left corner of the screen. Compare this result with the two-letter checksum printed to the left of the line in the program listing. If the letters match, it's almost certain the line was typed correctly. If not, check for your mistake and correct the line.

The *Proofreader* ignores spaces not enclosed in quotation marks, so you can omit or add spaces between keywords and still see a matching checksum. However, spaces inside quotes are almost always significant, so the program pays attention to them.

The *Proofreader* does *not* accept keyword abbreviations (for example, ? instead of PRINT). If you prefer to use abbreviations, you can still check the line by LISTing it, moving the cursor back to the line, and pressing RETURN.

If you're using the *Proofreader* on the 128, *do not perform any GRAPHIC commands while the* Proofreader *is active*. When you perform a command like GRAPHIC 1, the computer moves everything at the start of BASIC program space—including the *Proofreader*—to another memory area, causing the *Proofreader* to crash. The same thing happens if you run any program with a GRAPHIC command while the *Proofreader* is in memory.

Though the *Proofreader* doesn't interfere with other BASIC operations, it's a good idea to disable it before running another program. The simplest way to disable it is to turn the computer off then on. A gentler method is to SYS to the computer's built-in reset routine (65341 for the 128, 64738 for the 64). These reset routines erase any program in memory, so be sure to save the program you're typing in before entering the SYS command.

When using the *Proofreader* with another utility, disable *both* programs before running a BASIC program. While the *Proofreader* seems unaffected by most utilities, there's no way to promise it will work with any and every combination of utilities you might want to use. The more utilities activated, the more fragile the system becomes.

The Automatic Proofreader

```
10 VE=PEEK(772)+256*PEEK(773):LO
   =43:HI=44:PRINT "{CLR}{WHT}AU
   TOMATIC PROOFREADER FOR ";
20 IF VE=42364 THEN PRINT"C-64"
30 IF VE=17165 THEN LO=45:HI=46:
   WAIT CLR:PRINT "128"
40 SA=(PEEK(LO)+256*PEEK(HI))+6:
   FOR J=SA TO SA+166:READ B:POK
   E J,B:CH=CH+B:NEXT
50 IF CH<>20570 THEN PRINT "*ERR
   OR* CHECK TYPING IN DATA STAT
   EMENTS":END
60 FOR J=1 TO 5:READ RF,LF,HF:RS
   =SA+RF:HB=INT(RS/256):LB=RS-(
   256*HB)
70 CH=CH+RF+LF+HF:POKE SA+LF,LB:
   POKE SA+HF,HB:NEXT
80 IF CH<>22054 THEN PRINT "*ERR
   OR* RELOAD PROGRAM AND CHECK
   {SPACE}FINAL LINE":END
90 IF VE=17165 THEN POKE SA+14,2
   2:POKE SA+18,23:POKESA+29,224
   :POKESA+139,224
100 POKE SA+149,PEEK(772):POKE S
   A+150,PEEK(773):PRINT "{CLR}P
   ROOFREADER ACTIVE"
110 SYS SA:POKE HI,PEEK(HI)+1:PO
   KE (PEEK(LO)+256*PEEK(HI))-1,
   0:NEW
120 DATA120,169,73,141,4,3,169,3
   ,141,5,3,88,96,165,20,133,167
130 DATA165,21,133,168,169,0,141
   ,0,255,162,31,181,199,157,227
140 DATA3,202,16,248,169,19,32,2
   10,255,169,18,32,210,255,160
150 DATA0,132,180,132,176,136,23
   0,180,200,185,0,2,240,46,201
160 DATA34,208,8,72,165,176,73,2
   55,133,176,104,72,201,32,208
170 DATA7,165,176,208,3,104,208,
   226,104,166,180,24,165,167
180 DATA121,0,2,133,167,165,168,
   105,0,133,168,202,208,239,240
190 DATA202,165,167,69,168,72,41
   ,15,168,185,211,3,32,210,255
200 DATA104,74,74,74,74,168,185,
   211,3,32,210,255,162,31,189
210 DATA227,3,149,199,202,16,248
   ,169,146,32,210,255,76,86,137
220 DATA65,66,67,68,69,70,71,72,
   74,75,77,80,81,82,83,88
230 DATA13,2,7,167,31,32,151,116
   ,117,151,128,129,167,136,137
```

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MLX Machine Language Entry Program for Commodore 64 and 128

Ottis R. Cowper

MLX is a labor-saving utility that allows almost fail-safe entry of machine language programs. Included are versions for the Commodore 64 and 128.

Type in and save some copies of the version of *MLX* appropriate for your computer (you'll want to use it to enter future ML programs from *Gazette*). When you're ready to enter an ML program, load and run *MLX*. It asks you for a starting address and an ending address. These addresses appear in the article accompanying the *MLX*-format program listing you're entering.

If you're unfamiliar with machine language, the addresses (and all other values you enter in *MLX*) may appear strange. Instead of the usual decimal numbers you're accustomed to seeing, these numbers are in *hexadecimal*—a base 16 numbering system commonly used by ML programmers. Hexadecimal—hex for short—includes the numerals 0–9 and the letters *A–F*. But even if you know nothing about ML or hex, you should have no trouble using *MLX*.

After you've entered the starting and ending addresses, you'll be offered the option of clearing the workspace. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session, don't choose this option.

A functions menu will appear. The first option in the menu is Enter Data. If you're just starting to type in a program, pick this. Press the E key and type the first number in the first line of the program listing. If you've already typed in part of a program, type the line number where you stopped typing at the end of the previous session (be sure to load the partially completed program before you resume entry). In any case, make sure the address you enter corresponds to the address of a line in the listing you are entering. Otherwise, you'll be unable to enter the data correctly. If you pressed E by mistake, you can return to the command menu by pressing RETURN alone when asked for the address. (You can get back to the menu from most options by pressing RETURN with no other input.)

Entering a Listing

Once you're in Enter mode, *MLX* prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a checksum. Although an *MLX*-format listing appears similar to the "hex dump" listings from a machine language monitor program, the extra checksum number on the end allows *MLX* to check your typing. (Commodore 128 users *can* enter the data from an *MLX* listing using the built-in monitor if the rightmost column of data is omitted, but we don't recommend it. It's much easier to let *MLX* do the proofreading and error checking for you.)

When you enter a line, *MLX* recalculates the checksum from the eight bytes and the address and then compares this value to the number from the ninth column. If the values match, you'll hear a bell tone, the data will be added to the workspace area, and the prompt for the next line of data will appear. But if *MLX* detects a typing error, you'll hear a low buzz and see an error message. The line will then be redisplayed for editing.

Invalid Characters Banned

Only a few keys are active while you're entering data, so you may have to unlearn some habits. You *do not* type spaces between the columns; *MLX* automatically inserts these for you. You *do not* press RETURN after typing the last number in a line; *MLX* automatically enters and checks the line after you've typed the last digit.

Only the numerals 0–9 and the letters *A–F* can be typed in. If you press any other key (with some exceptions noted below), you'll hear a warning buzz. To simplify typing, *64 MLX* features a simulated keypad (see Figure 1). The 128 version redefines the function keys and + and − keys on the numeric keypad (see Figure 2) so that you can enter data one-handed. In both cases, the keypad is active only while entering data. Addresses must be entered with the normal letter and number keys.

MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, *MLX* will catch your mistake. There is one error that can slip past *MLX*: Because of the checksum formula used, *MLX* won't notice if you accidentally type FF in place of 00, and vice versa. And there's a very slim chance that you could garble a line and still end up with a combination of characters that adds up to the proper checksum. However, these mistakes should not occur if you take reasonable care while entering data.

Figure 1. 64 MLX Keypad

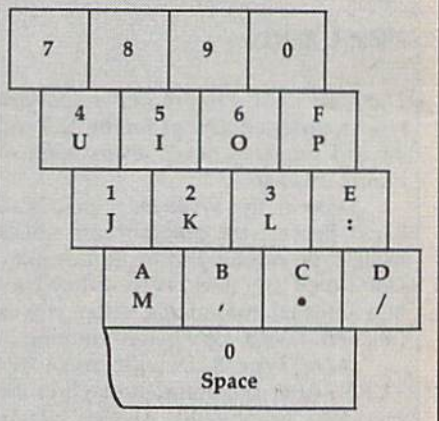
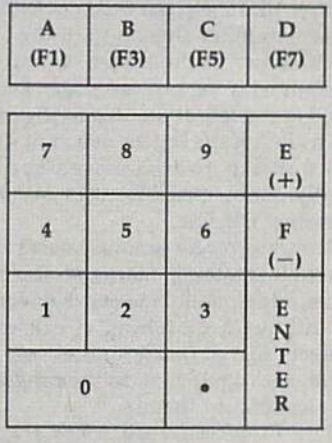


Figure 2. 128 MLX Keypad



Editing Features

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. (The cursor-left key also deletes.) If you mess up a line badly, press CLR/HOME to start the line over. The RETURN key is also active, but only before any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character, *MLX* disables RETURN until the cursor returns to the start of a line. Remember, press CLR/HOME to quickly get to a line-number prompt.

To make corrections in a line that *MLX* has redisplayed for editing, compare the line on the screen with the one printed in the listing; then move the cursor to the mistake and type the cor-

rect key. The cursor-left and -right keys provide the normal cursor controls. (The INST/DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. During editing, RETURN is active; pressing it tells *MLX* to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch or if you want to get to a line-number prompt to use RETURN to get back to the menu.

Display Data

The second menu choice, Display Data, examines memory and shows the contents in the same format as the program listing (including the checksum). When you press D, *MLX* asks you for a starting address. Be sure that the starting address you give corresponds to a line number in the listing. Otherwise, the checksum display will be meaningless. *MLX* displays program lines until it reaches the end of the program, at which point the menu is redisplayed. You can pause the display by pressing the space bar. (*MLX* finishes printing the current line before halting.) Press the space bar again to restart the display. To break out of the display and get back to the menu before the ending address is reached, press RETURN.

Other Menu Options

Two more menu selections let you save programs and load them back into the computer. These are Save File and Load File. When you press S or L, *MLX* asks you for the filename. You'll then be asked to press either D or T to select disk or tape.

You'll notice the disk drive starting and stopping several times during a load (and a save with the 128 version). This is normal behavior. *MLX* opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands (*128 MLX* makes use of BLOAD). Disk users should also note that the drive prefix 0: is automatically added to the filename (line 750 in *64 MLX*), so this should *not* be included when entering the name. This also precludes the use of @ for save-with-replace, so remember to give each version you save a different name. The 128 version makes up for this by giving you the option of scratching the existing file if you want to reuse a filename.

Remember that *MLX* saves the entire workspace area from the starting address to the ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When you're saving a partially completed listing, make sure to note the address where you stopped typing.

MLX reports the standard disk or tape error messages if any problems are detected during the save or load. (Remember that tape save errors can't be detected.) *MLX* also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran *MLX;* LOAD ENDED AT *address*, which means the file you're trying to load ends before the ending address you specified when you started *MLX;* and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you specified when you started *MLX*. If you see one of these messages and feel certain that you've loaded the right file, exit and rerun *MLX*, being careful to enter the correct starting and ending addresses.

The 128 version also has a Catalog Disk option so you can view the contents of the disk directory before saving or loading.

The Quit menu option has the obvious effect—it stops *MLX* and enters BASIC. The RUN/STOP key is disabled, so the Q option lets you exit the program without turning off the computer. (Of course, RUN/STOP-RESTORE also gets you out.) You'll be asked for verification; press Y to exit to BASIC or any other key to return to the menu. After quitting, you can type RUN again and reenter *MLX* without losing your data, as long as you don't use the Clear Workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready for the results. The instructions for loading and using the finished product vary from program to program. Refer to the corresponding article for details on loading and running the program.

An Ounce of Prevention

By the time you've finished typing in the data for a long ML program, you may have several hours invested in the project. Don't take chances—use *The Automatic Proofreader* to type the new *MLX*, and then test your copy *thoroughly* before first using it to enter any significant amount of data. Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses; then use the display option to verify that the data has been entered correctly. And be sure to test the save and load options several times to ensure that you can recall your work from disk or tape. Don't let a simple typing error in the new *MLX* cost you several nights of hard work.

64 MLX

```
EK 100 POKE 56,50:CLR:DIM IN$,I,
       J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z4=
       254:Z5=255:Z6=256:Z7=127
CJ 120 FA=PEEK(45)+Z6*PEEK(46):B
       S=PEEK(55)+Z6*PEEK(56):H$
       ="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="{LEFT}":S
       $=" ":D$=CHR$(20):Z$=CHR$
       (0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD+2
       3:POKE I,0:NEXT:POKE SD+2
       4,15:POKE 788,52
FC 150 PRINT"{CLR}"CHR$(142)CHR$
       (8):POKE 53280,15:POKE 53
       281,15
EJ 160 PRINT T$" {RED}{RVS}
       {2 SPACES}{8 @}{2 SPACES}
       "SPC(28)"{2 SPACES}{OFF}
       {BLU} MLX II {RED}{RVS}
       {2 SPACES}"SPC(28)"
       {12 SPACES}{BLU}"
FR 170 PRINT"{3 DOWN}{3 SPACES}C
       OMPUTE!'S MACHINE LANGUAG
       E EDITOR{3 DOWN}"
JB 180 PRINT"{BLK}STARTING ADDRE
       SS{4}";:GOSUB300:SA=AD:GO
       SUB1040:IF F THEN180
GF 190 PRINT"{BLK}{2 SPACES}ENDI
       NG ADDRESS{4}";:GOSUB300:
       EA=AD:GOSUB1030:IF F THEN
       190
KR 200 INPUT"{3 DOWN}{BLK}CLEAR
       {SPACE}WORKSPACE [Y/N]{4}
       ";A$:IF LEFT$(A$,1)<>"Y"T
       HEN220
PG 210 PRINT"{2 DOWN}{BLU}WORKIN
       G...";:FORI=BS TO BS+EA-S
       A+7:POKE I,0:NEXT:PRINT"D
       ONE"
DR 220 PRINTTAB(10)"{2 DOWN}
       {BLK}{RVS} MLX COMMAND ME
       NU {DOWN}{4}":PRINT T$"
       {RVS}E{OFF}NTER DATA"
BD 230 PRINT T$"{RVS}D{OFF}ISPLA
       Y DATA":PRINT T$"{RVS}L
       {OFF}OAD FILE"
JS 240 PRINT T$"{RVS}S{OFF}AVE F
       ILE":PRINT T$"{RVS}Q{OFF}
       UIT{2 DOWN}{BLK}"
JH 250 GET A$:IF A$=N$ THEN250
HK 260 A=0:FOR I=1 TO 5:IF A$=MI
       D$("EDLSQ",I,1)THEN A=I:I
       =5
FD 270 NEXT:ON A GOTO420,610,690
       ,700,280:GOSUB1060:GOTO25
       0
EJ 280 PRINT"{RVS} QUIT ":INPUT"
       {DOWN}{4}ARE YOU SURE [Y/
       N]";A$:IF LEFT$(A$,1)<>"Y
       "THEN220
EM 290 POKE SD+24,0:END
JX 300 IN$=N$:AD=0:INPUTIN$:IFLE
       N(IN$)<>4THENRETURN
KF 310 B$=IN$:GOSUB320:AD=A:B$=M
       ID$(IN$,3):GOSUB320:AD=AD
       *256+A:RETURN
PP 320 A=0:FOR J=1 TO 2:A$=MID$(
       B$,J,1):B=ASC(A$)-C4+(A$>
       "@")*C7:A=A*C6+B
JA 330 IF B<0 OR B>15 THEN AD=0:
       A=-1:J=2
GX 340 NEXT:RETURN
CH 350 B=INT(A/C6):PRINT MID$(H$
       ,B+1,1);:B=A-B*C6:PRINT M
       ID$(H$,B+1,1);:RETURN
RR 360 A=INT(AD/Z6):GOSUB350:A=A
       D-A*Z6:GOSUB350:PRINT":";
BE 370 CK=INT(AD/Z6):CK=AD-Z4*CK
       +Z5*(CK>Z7):GOTO390
PX 380 CK=CK*Z2+Z5*(CK>Z7)+A
JC 390 CK=CK+Z5*(CK>Z5):RETURN
QS 400 PRINT"{DOWN}STARTING AT
       {4}";:GOSUB300:IF IN$<>N$
```

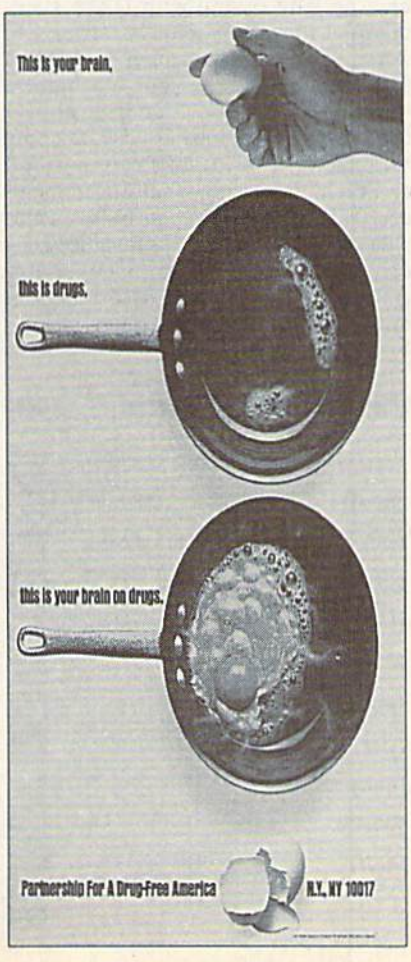
```
        THEN GOSUB1030:IF F THEN
        400
EX 410  RETURN
HD 420  PRINT"{RVS} ENTER DATA ":
        GOSUB400:IF IN$=N$ THEN22
        0
JK 430  OPEN3,3:PRINT
SK 440  POKE198,0:GOSUB360:IF F T
        HEN PRINT IN$:PRINT"{UP}
        {5 RIGHT}";
GC 450  FOR I=0 TO 24 STEP 3:B$=S
        $:FOR J=1 TO 2:IF F THEN
        {SPACE}B$=MID$(IN$,I+J,1)
HA 460  PRINT"{RVS}"B$L$;:IF I<24
        THEN PRINT"{OFF}";
HD 470  GET A$:IF A$=N$ THEN470
FK 480  IF(A$>"/"ANDA$<":")OR(A$>
        "@"ANDA$<"G")THEN540
GS 485  A=-(A$="M")-2*(A$=",")-3*
        (A$=".")-4*(A$="/")-5*(A$
        ="J")-6*(A$="K")
FX 486  A=A-7*(A$="L")-8*(A$=":")
        -9*(A$="U")-10*(A$="I")-1
        1*(A$="O")-12*(A$="P")
CM 487  A=A-13*(A$=S$):IF A THEN
        {SPACE}A$=MID$("ABCD123E4
        56F0",A,1):GOTO 540
MP 490  IF A$=R$ AND((I=0)AND(J=1
        )OR F)THEN PRINT B$;:J=2:
        NEXT:I=24:GOTO550
KC 500  IF A$="{HOME}" THEN PRINT
         B$:J=2:NEXT:I=24:NEXT:F=
        0:GOTO440
MX 510  IF(A$="{RIGHT}")ANDF THEN
        PRINT B$L$;:GOTO540
GK 520  IF A$<>L$ AND A$<>D$ OR((
        I=0)AND(J=1))THEN GOSUB10
        60:GOTO470
HG 530  A$=L$+S$+L$:PRINT B$L$;:J
        =2-J:IF J THEN PRINT L$;:
        I=I-3
QS 540  PRINT A$;:NEXT J:PRINT S$
        ;
PM 550  NEXT I:PRINT:PRINT"{UP}
        {5 RIGHT}";:INPUT#3,IN$:I
        F IN$=N$ THEN CLOSE3:GOTO
        220
QC 560  FOR I=1 TO 25 STEP3:B$=MI
        D$(IN$,I):GOSUB320:IF I<2
        5 THEN GOSUB380:A(I/3)=A
PK 570  NEXT:IF A<>CK THEN GOSUB1
        060:PRINT"{BLK}{RVS} ERRO
        R: REENTER LINE {4}":F=1:
        GOTO440
HJ 580  GOSUB1080:B=BS+AD-SA:FOR
        {SPACE}I=0 TO 7:POKE B+I,
        A(I):NEXT
QQ 590  AD=AD+8:IF AD>EA THEN CLO
        SE3:PRINT"{DOWN}{BLU}** E
        ND OF ENTRY **{BLK}
        {2 DOWN}":GOTO700
GQ 600  F=0:GOTO440
QA 610  PRINT"{CLR}{DOWN}{RVS} DI
        SPLAY DATA ":GOSUB400:IF
        {SPACE}IN$=N$ THEN220
RJ 620  PRINT"{DOWN}{BLU}PRESS:
        {RVS}SPACE{OFF} TO PAUSE,
         {RVS}RETURN{OFF} TO BREA
        K{4}{DOWN}"
KS 630  GOSUB360:B=BS+AD-SA:FORI=
        BTO B+7:A=PEEK(I):GOSUB35
        0:GOSUB380:PRINT S$;
CC 640  NEXT:PRINT"{RVS}";:A=CK:G
        OSUB350:PRINT
KH 650  F=1:AD=AD+8:IF AD>EA THEN
        PRINT"{DOWN}{BLU}** END O
        F DATA **":GOTO220
KC 660  GET A$:IF A$=R$ THEN GOSU
        B1080:GOTO220
EQ 670  IF A$=S$ THEN F=F+1:GOSUB
        1080
AD 680  ONFGOTO630,660,630
CM 690  PRINT"{DOWN}{RVS} LOAD DA
        TA ":OP=1:GOTO710
PC 700  PRINT"{DOWN}{RVS} SAVE FI
        LE ":OP=0
RX 710  IN$=N$:INPUT"{DOWN}FILENA
        ME{4}";IN$:IF IN$=N$ THEN
        220
PR 720  F=0:PRINT"{DOWN}{BLK}
        {RVS}T{OFF}APE OR {RVS}D
        {OFF}ISK: {4}";
FP 730  GET A$:IF A$="T"THEN PRIN
        T"T{DOWN}":GOTO880
HQ 740  IF A$<>"D"THEN730
HH 750  PRINT"D{DOWN}":OPEN15,8,1
        5,"I0:":B=EA-SA:IN$="0:"+
        IN$:IF OP THEN810
SQ 760  OPEN 1,8,8,IN$+",P,W":GOS
        UB860:IF A THEN220
FJ 770  AH=INT(SA/256):AL=SA-(AH*
        256):PRINT#1,CHR$(AL);CHR
        $(AH);
PE 780  FOR I=0 TO B:PRINT#1,CHR$
        (PEEK(BS+I));:IF ST THEN8
        00
FC 790  NEXT:CLOSE1:CLOSE15:GOTO9
        40
GS 800  GOSUB1060:PRINT"{DOWN}
        {BLK}ERROR DURING SAVE:
        {4}":GOSUB860:GOTO220
MA 810  OPEN 1,8,8,IN$+",P,R":GOS
        UB860:IF A THEN220
GE 820  GET#1,A$,B$:AD=ASC(A$+Z$)
        +256*ASC(B$+Z$):IF AD<>SA
         THEN F=1:GOTO850
RX 830  FOR I=0 TO B:GET#1,A$:POK
        E BS+I,ASC(A$+Z$):IF(I<>B
        )AND ST THEN F=2:AD=I:I=B
FA 840  NEXT:IF ST<>64 THEN F=3
FQ 850  CLOSE1:CLOSE15:ON ABS(F>0
        )+1 GOTO960,970
SA 860  INPUT#15,A,A$:IF A THEN C
        LOSE1:CLOSE15:GOSUB1060:P
        RINT"{RVS}ERROR: "A$
GQ 870  RETURN
EJ 880  POKE183,PEEK(FA+2):POKE18
        7,PEEK(FA+3):POKE188,PEEK
        (FA+4):IFOP=0THEN920
HJ 890  SYS 63466:IF(PEEK(783)AND
        1)THEN GOSUB1060:PRINT"
        {DOWN}{RVS} FILE NOT FOUN
        D ":GOTO690
CS 900  AD=PEEK(829)+256*PEEK(830
        ):IF AD<>SA THEN F=1:GOTO
        970
SC 910  A=PEEK(831)+256*PEEK(832)
        -1:F=F-2*(A<EA)-3*(A>EA):
        AD=A-AD:GOTO930
KM 920  A=SA:B=EA+1:GOSUB1010:POK
        E780,3:SYS 63338
JF 930  A=BS:B=BS+(EA-SA)+1:GOSUB
        1010:ON OP GOTO950:SYS 63
        591
AE 940  GOSUB1080:PRINT"{BLU}** S
        AVE COMPLETED **":GOTO220
XP 950  POKE147,0:SYS 63562:IF ST
        >0 THEN970
FR 960  GOSUB1080:PRINT"{BLU}** L
        OAD COMPLETED **":GOTO220
DP 970  GOSUB1060:PRINT"{BLK}
        {RVS}ERROR DURING LOAD:
        {DOWN}{4}":ON F GOSUB980,
        990,1000:GOTO220
PP 980  PRINT"INCORRECT STARTING
        {SPACE}ADDRESS (";:GOSUB3
        60:PRINT")":RETURN
GR 990  PRINT"LOAD ENDED AT ";:AD
        =SA+AD:GOSUB360:PRINT D$:
        RETURN
FD 1000 PRINT"TRUNCATED AT ENDIN
        G ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH*2
        56):POKE193,AL:POKE194,A
        H
FF 1020 AH=INT(B/256):AL=B-(AH*2
        56):POKE174,AL:POKE175,A
        H:RETURN
FX 1030 IF AD<SA OR AD>EA THEN10
        50
HA 1040 IF(AD>511 AND AD<40960)O
        R(AD>49151 AND AD<53248)
        THEN GOSUB1080:F=0:RETUR
        N
HC 1050 GOSUB1060:PRINT"{RVS} IN
        VALID ADDRESS {DOWN}
        {BLK}":F=1:RETURN
AR 1060 POKE SD+5,31:POKE SD+6,2
        08:POKE SD,240:POKE SD+1
        ,4:POKE SD+4,33
DX 1070 FOR S=1 TO 100:NEXT:GOTO
        1090
PF 1080 POKE SD+5,8:POKE SD+6,24
        0:POKE SD,0:POKE SD+1,90
        :POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:POKE
         SD+4,0:POKE SD,0:POKE S
        D+1,0:RETURN
```

128 MLX

```
AE 100  TRAP 960:POKE 4627,128:DI
        M NL$,A(7)
XP 110  Z2=2:Z4=254:Z5=255:Z6=256
        :Z7=127:BS=256*PEEK(4627)
        :EA=65280
FB 120  BE$=CHR$(7):RT$=CHR$(13):
        DL$=CHR$(20):SP$=CHR$(32)
        :LF$=CHR$(157)
KE 130  DEF FNHB(A)=INT(A/256):DE
        F FNLB(A)=A-FNHB(A)*256:D
        EF FNAD(A)=PEEK(A)+256*PE
        EK(A+1)
JB 140  KEY 1,"A":KEY 3,"B":KEY 5
        ,"C":KEY 7,"D":VOL 15:IF
        {SPACE}RGR(0)=5 THEN FAST
FJ 150  PRINT"{CLR}"CHR$(142);CHR
        $(8):COLOR 0,15:COLOR 4,1
        5:COLOR 6,15
GQ 160  PRINT TAB(12)"{RED}{RVS}
        {2 SPACES}{9 @}{2 SPACES}
        "RT$;TAB(12)"{RVS}
        {2 SPACES}{OFF}{BLU} 128
        {SPACE}MLX {RED}{RVS}
        {2 SPACES}"RT$;TAB(12)"
        {RVS}{13 SPACES}{BLU}"
FE 170  PRINT"{2 DOWN}{3 SPACES}C
        OMPUTE!'S MACHINE LANGUAG
        E EDITOR{2 DOWN}"
DK 180  PRINT"{BLK}STARTING ADDRE
        SS{4}";:GOSUB 260:IF AD T
        HEN SA=AD:ELSE 180
FH 190  PRINT"{BLK}{2 SPACES}ENDI
        NG ADDRESS{4}";:GOSUB 260
        :IF AD THEN EA=AD:ELSE 19
        0
MF 200  PRINT"{DOWN}{BLK}CLEAR WO
        RKSPACE [Y/N]?{4}":GETKEY
         A$:IF A$<>"Y" THEN 220
MM 210  PRINT"{DOWN}{BLU}WORKING.
        ..";:BANK 0:FOR A=BS TO B
        S+(EA-SA)+7:POKE A,0:NEXT
         A:PRINT"DONE":REM CLEAR
        {SPACE}MEMORY
DC 220  PRINT TAB(10)"{DOWN}{BLK}
        {RVS} MLX COMMAND MENU
        {4}{DOWN}":PRINT TAB(13)"
        {RVS}E{OFF}NTER DATA"RT$;
        TAB(13)"{RVS}D{OFF}ISPLAY
         DATA"RT$;TAB(13)"{RVS}L
        {OFF}OAD FILE"
HB 230  PRINT TAB(13)"{RVS}S{OFF}
        AVE FILE"RT$;TAB(13)"
        {RVS}C{OFF}ATALOG DISK"RT
        $;TAB(13)"{RVS}Q{OFF}UIT
        {DOWN}{BLK}"
AP 240  GETKEY A$:A=INSTR("EDLSCQ
        ",A$):ON A GOTO 340,550,6
        40,650,930,940:GOSUB 950:
        GOTO 240
SX 250  PRINT"STARTING AT";:GOSUB
         260:IF(AD<>0)OR(A$=NL$)T
        HEN RETURN:ELSE 250
EA 260  A$=NL$:INPUT A$:IF LEN(A$
        )=4 THEN AD=DEC(A$):REM F
        ETCH ADDRESS
PP 270  IF AD=0 THEN BEGIN:IF A$<
        >NL$ THEN 300:ELSE RETURN
```

```
        :BEND
MA 280 IF AD<SA OR AD>EA THEN 30
       0
PM 290 IF AD>511 AND AD<65280 TH
       EN PRINT BE$;:RETURN
SQ 300 GOSUB 950:PRINT"{RVS} INV
       ALID ADDRESS {DOWN}{BLK}"
       :AD=0:RETURN
RD 310 CK=FNHB(AD):CK=AD-Z4*CK+Z
       5*(CK>Z7):GOTO 330
DD 320 CK=CK*Z2+Z5*(CK>Z7)+A
AH 330 CK=CK+Z5*(CK>Z5):RETURN
DJ 340 PRINT BE$;"{RVS} ENTER DA
       TA ":GOSUB 250:IF A$=NL$
       {SPACE}THEN 220:REM E OPT
       ION
JA 350 BANK 0:PRINT:F=0:OPEN 3,3
BR 360 GOSUB 310:PRINT HEX$(AD)+
       ":";:IF F THEN PRINT L$:P
       RINT"{UP}{5 RIGHT}";
QA 370 FOR I=0 TO 24 STEP 3:B$=S
       P$:FOR J=1 TO 2:IF F THEN
        B$=MID$(L$,I+J,1)
PS 380 PRINT"{RVS}"B$+LF$;:IF I<
       24 THEN PRINT"{OFF}";
RC 390 GETKEY A$:IF (A$>"/" AND
       {SPACE}A$<":") OR(A$>"@"
       {SPACE}AND A$<"G") THEN 4
       70
AC 400 IF A$="+" THEN A$="E":GOT
       O 470
QB 410 IF A$="-" THEN A$="F":GOT
       O 470
FB 420 IF A$=RT$ AND ((I=0) AND
       {SPACE}(J=1) OR F) THEN P
       RINT B$;:J=2:NEXT:I=24:GO
       TO 480
RD 430 IF A$="{HOME}" THEN PRINT
        B$:J=2:NEXT:I=24:NEXT:F=
       0:GOTO 360
XB 440 IF (A$="{RIGHT}") AND F T
       HEN PRINT B$+LF$;:GOTO 47
       0
JP 450 IF A$<>LF$ AND A$<>DL$ OR
        ((I=0) AND (J=1)) THEN G
       OSUB 950:GOTO 390
PS 460 A$=LF$+SP$+LF$:PRINT B$+L
       F$;:J=2-J:IF J THEN PRINT
        LF$;:I=I-3
GB 470 PRINT A$;:NEXT J:PRINT SP
       $;
HA 480 NEXT I:PRINT:PRINT"{UP}
       {5 RIGHT}";:L$="
       {27 SPACES}"
DP 490 FOR I=1 TO 25 STEP 3:GET#
       3,A$,B$:IF A$=SP$ THEN I=
       25:NEXT:CLOSE 3:GOTO 220
BA 500 A$=A$+B$:A=DEC(A$):MID$(L
       $,I,2)=A$:IF I<25 THEN GO
       SUB 320:A(I/3)=A:GET#3,A$
AR 510 NEXT I:IF A<>CK THEN GOSU
       B 950:PRINT:PRINT"{RVS} E
       RROR: REENTER LINE ":F=1:
       GOTO 360
DX 520 PRINT BE$:B=BS+AD-SA:FOR
       {SPACE}I=0 TO 7:POKE B+I,
       A(I):NEXT I
XB 530 F=0:AD=AD+8:IF AD<=EA THE
       N 360
CA 540 CLOSE 3:PRINT"{DOWN}{BLU}
       ** END OF ENTRY **{BLK}
       {2 DOWN}":GOTO 650
QP 550 PRINT BE$;"{CLR}{DOWN}
       {RVS} DISPLAY DATA ":GOSU
       B 250:IF A$=NL$ THEN 220:
       REM SHOW OPTION
JF 560 BANK 0:PRINT"{DOWN}{BLU}P
       RESS: {RVS}SPACE{OFF} TO
       {SPACE}PAUSE, {RVS}RETURN
       {OFF} TO BREAK{4}{DOWN}"
XA 570 PRINT HEX$(AD)+":";:GOSUB
        310:B=BS+AD-SA
DJ 580 FOR I=B TO B+7:A=PEEK(I):
       PRINT RIGHT$(HEX$(A),2);S
       P$;:GOSUB 320:NEXT I
XB 590 PRINT"{RVS}";RIGHT$(HEX$(
       CK),2)
GR 600 F=1:AD=AD+8:IF AD>EA THEN
        PRINT"{BLU}** END OF DAT
       A **":GOTO 220
EB 610 GET A$:IF A$=RT$ THEN PRI
       NT BE$:GOTO 220
QK 620 IF A$=SP$ THEN F=F+1:PRIN
       T BE$;
XS 630 ON F GOTO 570,610,570
BQ 640 PRINT BE$"{DOWN}{RVS} LOA
       D DATA ":OP=1:GOTO 660:RE
       M LOAD OPTION
JA 650 PRINT BE$"{DOWN}{RVS} SAV
       E FILE ":OP=0:REM SAVE OP
       TION
DM 660 F=0:F$=NL$:INPUT"FILENAME
       {4}";F$:IF F$=NL$ THEN 22
       0
PF 665 IF LEN(F$)>14 THEN 660
RF 670 PRINT"{DOWN}{BLK}{RVS}T
       {OFF}APE OR {RVS}D{OFF}IS
       K: {4}";
SQ 680 GETKEY A$:IF A$="T" THEN
       {SPACE}850:ELSE IF A$<>"D
       " THEN 680
SP 690 PRINT"DISK{DOWN}":IF OP T
       HEN 760
EH 700 DOPEN#1,(F$+",P"),W:IF DS
        THEN A$=D$:GOTO 740
JH 710 BANK 0:POKE BS-2,FNLB(SA)
       :POKE BS-1,FNHB(SA):PRINT
       "SAVING ";F$:PRINT
MC 720 FOR A=BS-2 TO BS+EA-SA:PR
       INT#1,CHR$(PEEK(A));:IF S
       T THEN A$="DISK WRITE ERR
       OR":GOTO 750
GC 730 NEXT A:CLOSE 1:PRINT"
       {BLU}** SAVE COMPLETED WI
       THOUT ERRORS **":GOTO 220
RA 740 IF DS=63 THEN BEGIN:CLOSE
        1:INPUT"{BLK}REPLACE EXI
       STING FILE [Y/N]{4}";A$:I
       F A$="Y" THEN SCRATCH(F$)
       :PRINT:GOTO 700:ELSE PRIN
       T"{BLK}":GOTO 660:BEND
GA 750 CLOSE 1:GOSUB 950:PRINT"
       {BLK}{RVS} ERROR DURING S
       AVE: {4}":PRINT A$:GOTO 2
       20
FD 760 DOPEN#1,(F$+",P"):IF DS T
       HEN A$=DS$:F=4:CLOSE 1:GO
       TO 790
PX 770 GET#1,A$,B$:CLOSE 1:AD=AS
       C(A$)+256*ASC(B$):IF AD<>
       SA THEN F=1:GOTO 790
KB 780 PRINT"LOADING ";F$:PRINT:
       BLOAD(F$),B0,P(BS):AD=SA+
       FNAD(174)-BS-1:F=-2*(AD<E
       A)-3*(AD>EA)
RQ 790 IF F THEN 800:ELSE PRINT"
       {BLU}** LOAD COMPLETED WI
       THOUT ERRORS **":GOTO 220
ER 800 GOSUB 950:PRINT"{BLK}
       {RVS} ERROR DURING LOAD:
       {SPACE}{4}":ON F GOSUB 81
       0,820,830,840:GOTO220
QJ 810 PRINT"INCORRECT STARTING
       {SPACE}ADDRESS (";HEX$(AD
       );")":RETURN
DP 820 PRINT"LOAD ENDED AT ";HEX
       $(AD):RETURN
EB 830 PRINT"TRUNCATED AT ENDING
        ADDRESS ("HEX$(EA)")":RE
       TURN
FP 840 PRINT"DISK ERROR ";A$:RET
       URN
KS 850 PRINT"TAPE":AD=POINTER(F$
       ):BANK 1:A=PEEK(AD):AL=PE
       EK(AD+1):AH=PEEK(AD+2)
XX 860 BANK 15:SYS DEC("FF68"),0
       ,1:SYS DEC("FFBA"),1,1,0:
       SYS DEC("FFBD"),A,AL,AH:S
       YS DEC("FF90"),128:IF OP
       {SPACE}THEN 890
FG 870 PRINT:A=SA:B=EA+1:GOSUB 9
       20:SYS DEC("E919"),3:PRIN
       T"SAVING ";F$
AB 880 A=BS:B=BS+(EA-SA)+1:GOSUB
        920:SYS DEC("EA18"):PRIN
       T"{DOWN}{BLU}** TAPE SAVE
        COMPLETED **":GOTO 220
CP 890 SYS DEC("E99A"):PRINT:IF
       {SPACE}PEEK(2816)=5 THEN
       {SPACE}GOSUB 950:PRINT"
       {DOWN}{BLK}{RVS} FILE NOT
        FOUND ":GOTO 220
GQ 900 PRINT"LOADING ...{DOWN}":
       AD=FNAD(2817):IF AD<>SA T
       HEN F=1:GOTO 800:ELSE AD=
       FNAD(2819)-1:F=-2*(AD<EA)
       -3*(AD>EA)
JD 910 A=BS:B=BS+(EA-SA)+1:GOSUB
        920:SYS DEC("E9FB"):IF S
       T>0 THEN 800:ELSE 790
XB 920 POKE193,FNLB(A):POKE194,F
       NHB(A):POKE 174,FNLB(B):P
       OKE 175,FNHB(B):RETURN
AG 930 CATALOG:PRINT"{DOWN}{BLU}
       ** PRESS ANY KEY FOR MENU
        **":GETKEY A$:GOTO 220:R
       EM DISK DIRECTORY OPTION
MM 940 PRINT BE$"{RVS} QUIT {4}"
       ;RT$;"ARE YOU SURE [Y/N]?
       ":GETKEY A$:IF A$<>"Y" TH
       EN 220:ELSE PRINT"{CLR}":
       BANK 15:END
JE 950 SOUND 1,500,10:RETURN
AF 960 IF ER=14 AND EL=260 THEN
       {SPACE}RESUME 300
MK 970 IF ER=14 AND EL=500 THEN
       {SPACE}RESUME NEXT
KJ 980 IF ER=4 AND EL=780 THEN F
       =4:A$=DS$:RESUME 800
DQ 990 IF ER=30 THEN RESUME:ELSE
        PRINT ERR$(ER);" ERROR I
       N LINE";EL
```

G



How to Type In *COMPUTE!'s Gazette* Programs

Each month, *COMPUTE!'s Gazette* publishes programs for the Commodore 128 and 64. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We regularly publish two programs designed to make typing easier: *The Automatic Proofreader*, for BASIC programs, and *MLX*, for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off and then on, erasing what was in memory. This could cause you to lose valuable data, so be sure to *save a program before you run it.* If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from *Gazette*, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor-down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be shifted (hold down the SHIFT key while pressing another key), the character is underlined. For example, A means hold down the SHIFT key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example, enter eight shifted A's).

If a key is enclosed in special brackets, [ ], hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the CTRL key while typing the letter in braces. For example, {A} means to press CTRL-A.

The Quote Mode

Although you can move the cursor around the screen with the CRSR keys, often a programmer will want to move the cursor under program control. This is seen in examples such as {LEFT} and {HOME} in the program listings. The only way the computer can tell the difference between direct and programmed cursor control is the *quote mode.*

Once you press the quote key, you're in quote mode. This mode can be confusing if you mistype a character and cursor left to change it. You'll see a graphics symbol for cursor left. In this case, you can use the DEL key to back up and edit the line. Type another quotation mark and you're out of quote mode. If things really get confusing, you can exit quote mode simply by pressing RETURN. Then just cursor up to the mistyped line and fix it.

When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT + ↑ CRSR ↓	
{DOWN}	↑ CRSR ↓	
{LEFT}	SHIFT + ← CRSR →	
{RIGHT}	← CRSR →	
{RVS}	CTRL 9	
{OFF}	CTRL 0	
{BLK}	CTRL 1	
{WHT}	CTRL 2	
{RED}	CTRL 3	
{CYN}	CTRL 4	

When You Read:	Press:	See:
{PUR}	CTRL 5	
{GRN}	CTRL 6	
{BLU}	CTRL 7	
{YEL}	CTRL 8	
{ F1 }	f1	
{ F2 }	SHIFT f1	
{ F3 }	f3	
{ F4 }	SHIFT f3	
{ F5 }	f5	
{ F6 }	SHIFT f5	
{ F7 }	f7	
{ F8 }	SHIFT f7	

When You Read:	Press:	See:
←	←	
↑	SHIFT ↑	

For Commodore 64 Only

[1]	COMMODORE 1	
[2]	COMMODORE 2	
[3]	COMMODORE 3	
[4]	COMMODORE 4	
[5]	COMMODORE 5	
[6]	COMMODORE 6	
[7]	COMMODORE 7	
[8]	COMMODORE 8	

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BACK ISSUES

Note: Only selected titles are listed in contents for each issue

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1987

January—Keyword Construction Set, One-Touch Function Key, GEOS Icon Changer, CP/M: Surviving with 40 Columns
February—Collision Course, Division Worksheet, MetaBASIC 64, MetaBASIC 128, 128 DOS Wedge, 128 Sound & Music (Pt. 4)
March—Ringside Boxing, Color Craft, 128 RAM Expansion, CP/M RAM Expansion, Sprite Manager
April—Omicron, Music Improvisor, *Print Shop* to GEOS, TurboSave 128, TurboSave 64, Countdown Timer
May—*SpeedScript* 3.0, Powerball, Cassette Sleeve Maker, No-SYS Loader, Fast Boot, Gameports
June—Bingo, Fraction Practice, Free-Form Filer, Disk Vacuum, Hi-Res Graphics on the 128
July—Basketball Sam & Ed, Calendar Maker, Crash Prevention, 128 Graph Designer, GEOS File Storage, Text Framer
August—Bounty Hunter, Sprite Magic, Sprite Stamp, 80-Column Sector Editor (128), Relative Files
September—Sub Attack, Exercise Pacer, Screen Maker, Impossible Scroll, Video Slide Show, 80-Column Magic
October—*SpeedScript 128*, Chopper Pilot, Stars: A Simulation of the Heavens, Directory Magic, Font Printer, Animator 64
November—Litterbug, Sketch Pad, Poster Printer, Renumber 64, Accessing the 128's 80-Column Screen
December—Crossroads, Snake Pit, Word Find, Animal Match, Disk Rapid Transit, PrintScreen, GeoTrash Restorer

1988

January—How to Buy a Modem, Buyer's Guide to Modems, Needlework Graphics Editor, Tile Paint, Sound Manager
February—Buyer's Guide to Graphics Programs, Easy Load, Turbo SpeedScript, Fast 64 Mode for the 128
March—CP/M Software for the 128 (Pt. 1), XPressCard 128, ML Cloner, Big Screen, Color Lister
April—CP/M Software for the 128 (Pt. 2), 3-D Speedway, SpeedFile 64, Ramdisk 128, Mirrors
May—Networking the 64, Guide to User Groups (Pt. 1), Treasure Diver, Mob Maker, 128 Math Graphics, 1541 Speed & Alignment Tester
June—Buyer's Guide to Printers, Guide to User Groups (Pt. 2), Arcade Volleyball, Excelfont-80 (128), Graphics Wedge
July—Hard Disk Drives for the 64/128, Civil War on Disk, Quick Save, Error Analyzer, SYS Stamper
August—MIDI Made Simple, Buyer's Guide to Music Software, Cribbage (128), 128 Shell Booter, 3-D Sprites, Zoom
September—Write All About It! (desktop publishing), Pattern Fill, Multicolor Graphics Dump, SpeedCheck 128, Disk Package, MultiSort 128
October—Commodore Goes Back to School, Buyer's Guide to Preschool Software, Scorpion II, 64 Compressor, SpeedPrint, Speed Columns, 128 Text Sorter
November—GEOS 2.0: A Major Upgrade, Buyer's Guide to Word Processors and Spelling Checkers, Rally Racer, Block Out (128), Sprite Killer, Notepad 64, Font Grabber (GEOS)
December—88's Best Games, Ringside LXIV!, Crossroads II, Digi-Sound, Dynamic Windows, Quick! (1541 speedup), 1526 PrintScreen, Key Lock

1989

January—Guided Tour of Major Online Services, How to Get Published, Disc Blitz, Jewel Grab, 128 Animator, Smooth-Scrolling Windows, Handy Filer, Smart Disassembler
February—Around the World with Commodore, Buyer's Guide to Personal Publishing Software, Tank Ambush, Gridloc (128), The Great Arcade Machine, 1581 Alphabetizer, Sound Wedge
March—Dream to Reality: Simulation Designers Speak Out, Buyer's Guide to Sports Games and Simulations, The Anglers, Bacteria (128), Planebender, Bitmap Buster, Monthly Calendar, MultiView
April—Designing Your Own Programs, Buyer's Guide to Programming Aids, Science Fiction on Disk, Space Worms, BASIC 10, File Saver (GEOS), Super Accelerator (128), Comparator
May—Care and Feeding of Dot-Matrix Printers, Fantasy on Disk, Guide to User Groups (Pt. 1), Knock 31, Hi-Res Windows, RAM Wedge 128, Super Slideshow, Quick Print, Close-up: GEOS 128 2.0
June—Best Arcade Sports Games, Guide to User Groups (Pt. 2), Match Mania, Jericho II, Hi-Res 80 (128), SpeedCount, Macro-BASIC (64/128), Grafix Converter, GEOS Help Pad
July—Speakers, Stereo, and MIDI Solutions; Mine Sweeper, Monster Bar-B-Q (128), Math Magic, CHR$ Graphics, Financial Planner, 1581 Directory Sorter, GEOS File Retriever
August—Here Come the Coin-Ops!, Explore Your 64!, Stars II, Disk Doubler (64/128), Quiz Maker (64/128), Sprite Fader 64, 80-Column Graphics (128), Screen Splitter, Notepad 128, Sprite Clock, Marathon (128)
September—Call Your User Group, Commodore's Back in the Classroom, Block Battle!, Wham Ball, 64 Animator, SpeedScript 128 Plus, Memo Card, Slideshow (GEOS), MR Scribble, EZ Bar Charter, On the Border (border routines)
October—Tips for Desktop Publishers, Slap Shot, Backdrops, Boot Maker, RGB Kit (128), 128 Graphics Compactor, Triple Search, Text Screen Editor, Diamonds, Disk Usage (GEOS)
November—Super Power Boosters, Cartridge Power!, White Water, DP BASIC, SpeedScript Easy Cursor, Copy 81, Flash Card, Universal Input, Turbo Format (GEOS), Vertical Scroller

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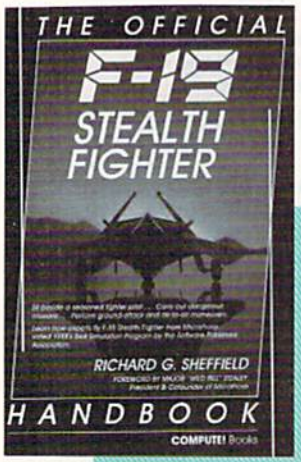

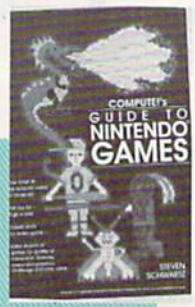

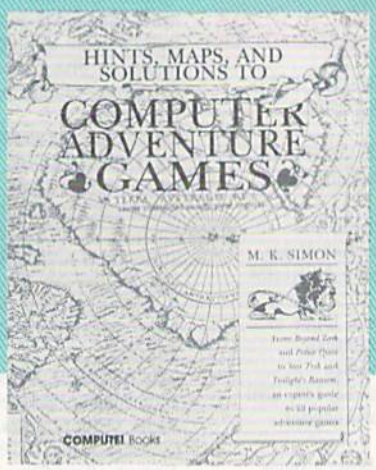

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COMMODORE CLIPS

NEWS, NOTES, AND NEW PRODUCTS

Edited by Mickey McLean

Alive and Well in Toronto

The Commodore 64 and 128 are slowly being supplanted by the Amiga line of computers, but at the World of Commodore show in Toronto last December, the 8-bit wonders were as strong as ever. Although there was no new 64/128 software announced, dealers were selling old and current titles at a brisk pace. *Gazette*'s line of 64 and 128 disk products was also a big hit with attendees. We also boosted our reader base in Canada with many new subscribers.

Commodore's large booth in the Toronto International Centre showcased its Amiga and PC lines, but intermingled with the newer machines were 64s and a 128D. Renown 64 expert and *Gazette* columnist Jim Butterfield also led seminars on how to get the most out of your Commodore computer.

Our representatives at the show were pleased to run into many old friends, including readers who have been with us since our inception in 1983.

Computer Toys

Fisher-Price has joined forces with software publisher GameTek (2999 Northeast 191st Street, Suite 800, North Miami Beach, Florida 33180) to produce six educational computer games for children ages 3–8. Each game is based on a popular Fisher-Price toy.

My Grand Piano ($14.95), a music program, teaches basic piano theory and music notes while entertaining children with 30 songs such as "Mary Had a Little Lamb" and "London Bridge." In *Bowling Alley* ($14.95), children learn basic math, coordination, and spatial relationships in a bowling game featuring curve balls, computer scoring, and sound effects. The role-playing game, *School Bus Driver* ($14.95), teaches navigation and memory skills as children pick up Fisher-Price Little People at bus stops and drive them to school. Children can develop number-recognition and visual-recall skills with *I Can Remember* ($14.95). In *Firehouse Rescue* ($14.95), children assume the role of firefighter, driving a fire truck and rescuing Little People and their cat while learning coordination and decision making. Children can develop skills in picture and shape recognition with *Perfect Fit* ($14.95). This match-and-fit game features sound effects and puzzles involving Fisher-Price toys and has three levels of difficulty.

New, Fast Hard Drives

The new HD Series Hard Drives from Creative Micro Designs (50 Industrial Drive, P.O. Box 646, East Longmeadow, Massachusetts 01028) are designed to be the fastest mass-storage peripherals for the 64 and 128.

Compatible with almost all commercial software titles, the drives have full GEOS and CP/M compatibility built in. The serial-bus interface supports standard serial as well as high-performance Fast Serial and JiffyDOS protocols. The drives' parallel port allows for connection to RAMLink, which enables even faster data transfer. The automatic head-parking feature protects the drive mechanism and your data when the unit is off.

The drives, about the same size as 1581 drives, are available in either 20MB ($599.95) or 40MB ($799.95) capacities. Creative Micro can also customize drive capacity, or you can connect the HD Series drive to other SCSI drives for more storage capacity.

The HD Series Hard Drives can also be interfaced with Amiga, IBM PC and compatible, and Macintosh computers.

64 Conversions

Cinemaware (4165 Thousand Oaks Boulevard, Westlake Village, California 91362) has converted two of its most popular games over to the Commodore 64. Now you can take to the gridiron with *TV Sports: Football* ($29.95) and explore a fantasy world in *Deathbringer* ($29.95). Both titles are distributed by Electronic Arts.

TV Sports: Football includes a 28-team league, a 16-game schedule, and postseason playoffs. You can choose from a variety of offensive and defensive formations and plays. Options include a one- or two-player game and a practice mode.

In *Deathbringer*, you take on the role of a Barbarian hero in a race against evil. Magical items found on your journey through dark castles, hidden forests, spooky towers, and secret temples help you on your quest.

COMMODORE CLIPS

NEWS, NOTES, AND NEW PRODUCTS

New International Version of Landmark

Landmark: The Computer Reference Bible ($119.95), previously available in the standard King James Version, has now been released in the New International Version of the Bible. The NIV comes with complete NIV footnotes, individual verse references, and the words of Jesus highlighted in red. Available from P.A.V.Y. Software (P.O. Box 1584, Ballwin, Missouri 63022), the NIV version carries an additional $10 royalty fee.

Flamethrower

Strategic Simulations (675 Almanor Avenue, Sunnyvale, California 94086) has released *Dragons of Flame* ($29.95), the second Advanced Dungeons & Dragons action game set in the Dragonlance game world.

You must lead the eight Companions of the Lance on a quest through the wilderness of the Elven Mosaic, where they gain valuable allies—the elves of Qualinesti. The Companions must also ally with nonplayer characters such as nomads and refugee townsfolk and sneak through the caves of Sla-Mori and into the fortress of Pax Tharkas. Once inside the fortress, the Companions must recover the sword, Wyrmslayer, and free the slaves held there by the evil dragons and Draconians.

Each companion has specialized skills that can be used to evade Draconian patrols and other evildoers and monsters. Ultimately, your goal is to triumph over evil and save the world of Krynn from Takhisis, the Queen of Darkness.

A *Dragon of Flame* clue book is available for $7.95. The SSI game is distributed in North America by Electronic Arts.

More Mindscape for the Money

Arcade and sports fans can beef up their game libraries with two new money-saving collections from Mindscape (3444 Dundee Road, Northbrook, Illinois 60062). Arcade Mega-Hits ($39.95) includes six popular arcade titles, while the sports collection ($34.95) contains four award-winning games developed by SportTime.

Gauntlet and *Paperboy*, two big sellers on their own, are included in Arcade Mega-Hits along with *Indiana Jones and the Temple of Doom*, *Road Runner*, and *Blockbuster*. The sports package features *Superstar Ice Hockey; Superstar Soccer; Indoor Sports*, which includes bowling, darts, air hockey, and Ping-Pong; and *Clubhouse Sports*, which challenges you to foosball, billiards, skeeball, crazy pool, pinball, and a shooting gallery.

In addition to the game packages, you can order Mindscape's Powerplayers joystick at a discounted price of $16.95. The joystick originally sold for $29.95.

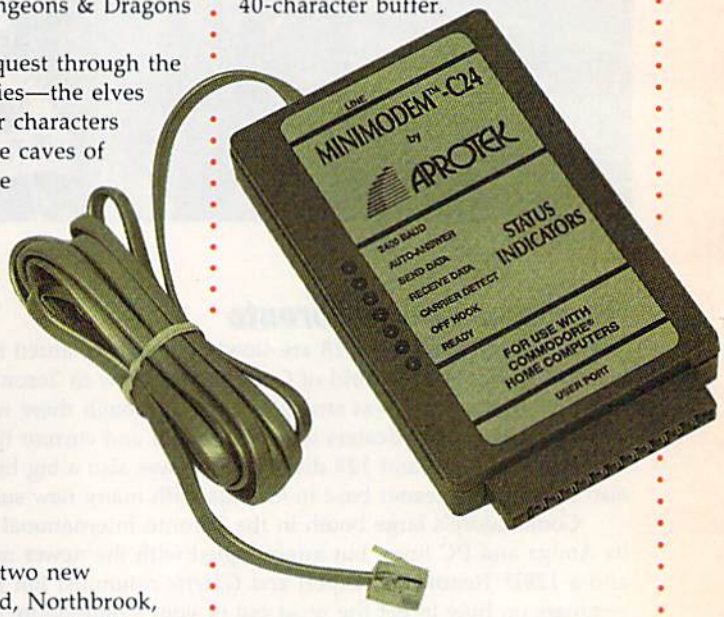
Legendary Knights

With *Knights of Legend* ($49.95) from Origin (136 Harvey Road, Building B, Londonderry, New Hampshire 03053), you'll take a journey through a medieval world consisting of intriguing quests. There are over 30 towns and hamlets to explore and you'll meet hundreds of unique and colorful personalities.

Up to six companions can be created with customized weaponry and armor. Game features include a menu-and-icon interface. A play book, reference card, and map are included with the package.

2400-Baud Modem

Aprotek (9323 West Evans Creek Road, Rogue River, Oregon 97537) has released the Minimodem-C24 ($99.95), a 2400-baud modem for the Commodore 64 and 128. The C24 features full- and half-duplex modes, autodial, autoanswer, autoredial, tone or adjustable pulse dialing, a data-voice-data switch, a volume-controlled on-board speaker, and a 40-character buffer.



To the Rescue

You're a powerful warrior searching for his kidnapped princess in *Savage* ($29.95) from Medalist International (180 Lakefront Drive, Hunt Valley, Maryland 21030).

To rescue the princess, you must battle your way through three game scenarios. In the first, you have only a battleax to fight off evil creatures. You're on foot in the second level of play, avoiding obstacles as you race toward the castle where the princess is held captive. In the third and final level, you telepathically communicate with a magical eagle that flies through a mystical maze seeking to complete the quest. More creatures are present, attempting to thwart the final stage of the rescue.

Great Games

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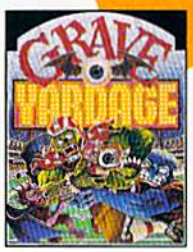

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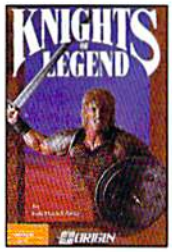

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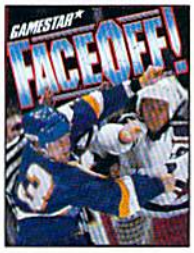

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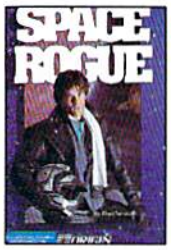

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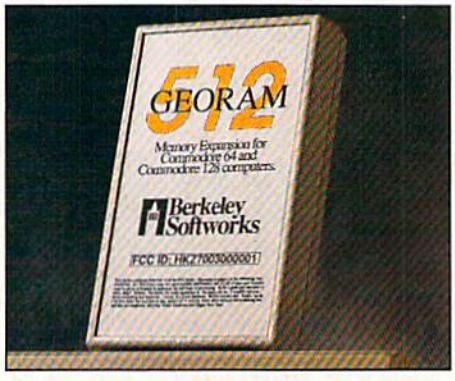

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